Safety and Airspace Regulation Group

16 August 2021

Policy Statement

POLICY FOR THE APPROVAL OF REMOTE AERODROME AIR TRAFFIC SERVICES V4.0

1   Introduction

1.1   Technological advancement enables the provision of aerodrome air traffic services (ATS) from locations/facilities without direct visual observation. Instead, the view of the aerodrome and its vicinity is based on means of technology and is provided from aerodrome visual control rooms at facilities not necessarily located on the site.

1.2   This policy statement supersedes that titled 'Policy for the Approval of Remote Aerodrome ATS V2.0' published on 8 July 2019. (Version 3.0 was not published)

1.3   The purpose of this Policy Statement is to provide guidance to those ATS providers, ANSPs and aerodrome operators who are seeking to provide remote aerodrome ATS.

2   Background

2.1   The remote tower concept has been pursued in numerous States and by the Single European Sky ATM Research Joint Undertaking (SESAR JU) project for several years. The concept introduces the possibility to provide aerodrome ATS from locations that can be on or off the aerodrome itself, and a number of projects are applying the technology around the world.

2.2   Aerodrome remote towers have the potential to bring increases in safety through the use of electro-optical technologies in low-visibility situations (however, currently nothing prevents the use of such technologies when the service is provided from a conventional tower). In addition, the possibility to add labels to objects moving on or around the aerodrome could assist in the prevention of runway incursions.

2.3   Since initial publication of this policy statement, the remote aerodrome ATS (RAATS) concept has continued to evolve with regard to provision of RAATS to multiple aerodromes, provision of ATS to larger/more complex single aerodromes, and operations supported by the introduction of new technical enablers. These topics, once further developed, will be addressed in Appendix D and Appendix E.

2.4   The CAA expects to be involved in the development of remote tower implementation projects from an early stage, working collaboratively with the affected Air Navigation Service Provider (ANSP) and aerodrome operator to determine how the approval process affects their proposal.

2.5   This policy will be updated as necessary as technology; industry deployment and implementation requirements evolve.

3. Scope

3.1 This policy statement sets out Civil Aviation Authority policy and guidance for the provision of air navigation services by means of an aerodrome remote tower facility described as remote aerodrome ATS.

4 Definitions

4.1 For the purposes of this policy statement, the following definitions apply, many of which have been sourced from ADR – Aerodromes: Remote Tower Operations Guidance Material (GM) (Issue 2) ("GM Remote Aerodrome ATS (RAATS)"):

a. 'Conventional tower' means a facility located at an aerodrome from which aerodrome ATS is provided principally through direct out-of-the-window observation of the aerodrome and its vicinity. (GM RAATS)

b. 'Direct visual observation' means observation through direct eyesight of objects situated within the line of sight of the observer, possibly enhanced by external elements (e.g. binoculars). (GM RAATS)

c. 'Electro-optical equipment' means components and devices forming a visual surveillance system. (ICAO Doc 4444 Amendment 8)

d. 'Latency' means the amount of time it takes to deliver data from one interface point to another interface point, corresponding to the processing and communication durations. (GM RAATS)

e. 'Out-the-window view' (OTW) means a view of the areas of responsibility of the aerodrome ATS unit from a conventional tower, obtained via direct visual observation. (GM RAATS)

f. 'Remote Aerodrome ATS' means (provision of) aerodrome ATS from a remote tower/remote tower module (RTM). (GM RAATS)

g. 'Remote Tower Centre (RTC)' means a facility housing one or more RTMs. (GM RAATS)

   Note: This may comprise of several RTMs working with single mode applications, or single/multiple RTM(s) working with multi-site control or a combination of these.

h. 'Remote tower' means a geographically independent facility from which aerodrome ATS is provided principally through indirect observation of the aerodrome and its vicinity, by means of a visual surveillance system. (It is to be seen as a generic term, equivalent in level to a conventional tower). (GM RAATS)

i. 'Remote tower module' means a combination of systems and constituents from where remote aerodrome ATS can be provided, including one or more ATCO/AFISO workstation(s) and the visual presentation. (It can be compared with the tower cabin of an aerodrome conventional tower. (GM RAATS)

j. 'Single mode of operation' means the provision of ATS from one RTM for one aerodrome at a time. (GM RAATS)

k. 'Visual presentation' means a view of the area(s) of responsibility of the aerodrome ATS unit, provided by a visual display. (GM RAATS)

l. 'Visual surveillance system' means of a number of integrated elements, normally consisting of optical sensor(s), data transmission links, data processing systems

and situation displays providing an electronic visual presentation of traffic and any other information necessary to maintain situational awareness at an aerodrome and its vicinity. (GM RAATS)

5. **Review of Policy** - The policy will be informed and revised as necessary by changes to UK legislation, EUROCAE, EUROCONTROL and International Civil Aviation Organisation (ICAO) requirements and recommendations as these evolve. Those changes notwithstanding, the CAA shall review this policy statement and its associated annexes on a discretionary basis but not less than triennially from its publication date.

6 **References**

6.1 Where appropriate, this document references EU Regulations, as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018, as source material. References to the 'Cover Regulation' are cited as:

Full form:
  a. Regulation (EU) No XXX/YYYY as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018 or;
  b. Regulation (EU) YYYY/XXX as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018.

Short Form (once it has already been defined in the text of a document by its 'full form'):
  a. UK Reg (EU) No XXX/YYYY or;
  b. UK Reg (EU) YYYY/XXX.

(where 'XXX' is the number of the Regulation and 'YYYY' is the year of publication).

Where applicable, references to provisions contained within an Annex to the Regulation are cited as they appear in the Annex; for example, provisions contained within the Standardised European Rules of the Air (SERA) Annex to UK Reg (EU) No 923/2012 are cited as:

  a. SERA.XXXX;

(where 'X' refers to the number of the provision).

6.2 **Legislation**

  • **Reg (EU) 2017/373 'Air Traffic Management/Air Navigation Services Implementing Rule' as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018** ("UK Reg (EU) 2017/373"); and
  • **Reg (EC) No 552/2004 'The Interoperability Regulation' as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018 (**"UK Reg (EC) No 552/2004"**);** and
  • **Reg (EU) 2015/340 'Air Traffic Controller Licensing' as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018** ("UK Reg (EU) 2015/340").

6.3 **Related CAA Policy.** We have included the most relevant documents below but a full list can be found in the **Airspace Publications page on the CAA Website.**

- **ADR – Aerodromes: Remote Tower Operations GM (Issue 2)** ("GM Remote Aerodrome ATS (RAATS)"); and
- **Air Traffic Services Safety Requirements (caa.co.uk) (**CAP 670); and
- **ATM Automation: Guidance on human technology integration** (CAP 1377); and
- **Manual of Air Traffic Services (MATS) Part 1 (caa.co.uk)** (CAP 493); and
- **Aerodrome Flight Information Service Officer Licensing (caa.co.uk)** (CAP 1032); and
- **Requirements for meteorological observations at aerodromes (caa.co.uk)** (CAP 746).

7 Point of Contact

7.1 Any queries or further guidance required on the content of this Airspace Policy Statement should be addressed to:

Airspace & ATM Policy
Airspace, ATM & Aerodromes
CAA Safety and Airspace Regulation Group
Aviation House
Beehive Ringroad
Crawley
West Sussex
RH6 0YR

E-mail: ats.enquiries@caa.co.uk

NOTE: - Queries regarding remote aerodrome meteorological observing services should be addressed to the UK Meteorology Authority; metauthority@caa.co.uk

Annex A: POLICY FOR THE APPROVAL OF REMOTE AERODROME AIR TRAFFIC SERVICES (ATS) V 4.0

Appendices:

A. **Specific Requirements for RAATS with basic equipage**
B. **Requirements for non-simultaneous Single Mode operations from a single RTM with basic or enhanced equipage**
C. **Requirements for Non-Simultaneous Single Mode operations from a single RTM with basic or enhanced equipage**
D. **Requirements for simultaneous multi-site control from a single RTM with basic or enhanced equipage**
E. **Ancillary Services**
F. **Personnel Training and Licensing**
G. **Parallel/Multiple co-located Runway Operations**

ANNEX A

POLICY FOR THE APPROVAL OF REMOTE AERODROME AIR TRAFFIC SERVICES (ATS) V4.0

1   Remote Tower Modes of Operation and Equipage Levels

1.1   The development and deployment of aerodrome remote tower technology will enable remote tower single and multiple modes of operation as defined at **Appendix A**.

1.2   Each mode may be associated with particular equipage levels as follows:

   a.   **Single Mode with basic equipage**. Representation of current on-site aerodrome conventional tower single mode visual control room with basic equipage. The RTM is used to provide remote ATS exclusively for one aerodrome at a time only. **Appendix A**.

   b.   **Single Mode with enhanced equipage**. Representation of current on-site aerodrome conventional tower single mode visual control room with enhanced equipage. The RTM is exclusively used for provision of ATS of one aerodrome at a time only. **Appendix B**.

   c.   **Non-simultaneous Single Mode from a single RTM with basic equipage**. This is single mode operation where the RTM may be configured to provide ATS to more than one aerodrome, but not at the same time, configured for basic equipage. **Appendix C**

   d.   **Non-simultaneous Single Mode from a single RTM with enhanced equipage**. This is single mode operation where the RTM may be configured to provide ATS to more than one aerodrome, but not at the same time, configured for enhanced equipage. **Appendix C**.

   e.   **Simultaneous Multiple Mode operations from a single RTM with basic equipage**. This is a Multiple Mode operation where ATS is provided from the same RTM to more than one aerodrome at the same time, configured for basic equipage. **Appendix D.**

   f.   **Simultaneous Multiple Mode operations from a single RTM with enhanced equipage**. This is a Multiple Mode operation where ATS is provided from the same RTM to more than one aerodrome at the same time, configured for enhanced equipage. **Appendix D**.

1.3   Basic and Advanced equipage levels:

   a.   GM RAATS [1] describes 'basic and advanced features as a division of technical enablers used by SESAR to validate different equipage levels'. Equipage levels for each operation would be dependent on a variety of factors e.g. traffic level and complexity (including mixture of aircraft and vehicles) as well as aerodrome layout and its complexity.

   b.   Basic equipage includes features such as (but not limited to):

        i.   visual presentation, replacing the OTW view of a conventional tower.

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[1] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) Appendix 4**

ii   binocular functionality (e.g. a Pan-Tilt-Zoom (PTZ) camera/function, as defined and described in EUROCAE ED-240A[2] fulfilling the function of a binocular in a conventional tower [maybe at least one other feature?]

c.   Advanced equipage includes features such as (but not limited to):

    i.   additional visual 'hot spot' cameras;

    ii.   the use of infrared or other optical sensors/cameras outside the visible spectrum;

    iii.   binocular functionality automatically following moving objects (commonly referred to as 'PTZ tracking');

    iv.   dedicated means to facilitate the detection, identification and automatic following of aircraft or vehicles in the visual presentation (e.g. by labels based on surveillance data, complemented by flight plan correlation when available, commonly referred to as 'radar tracking');

    v.   dedicated means to facilitate the detection and following of moving objects in the visual presentation (e.g. by highlighting/framing such objects based on image processing systems, commonly referred to as 'visual tracking');

    vi.   other overlaid information in the visual presentation such as framing and/or designation of runways, taxiways, etc., compass directions, meteorological information, aeronautical information (NOTAM, SNOWTAM, etc.), other operational information (e.g. runway conditions like water, snow or mud presence, coefficient of friction, etc.);

    vii.   ATS surveillance (air and/or ground radar presentation).

d.   The CAA splits overlaid information into 2 categories, surveillance and non-surveillance overlays.

    i.   Static visual overlays on the visual presentation can be permanent or temporary and could come in the form of aerodrome maps and information markers e.g. surface markings, hazardous areas or Work in Progress (WIP);

    ii.   Surveillance-derived dynamic overlays on the visual presentation selected for use at the workstation may include Secondary Surveillance Radar (SSR), Multilateration (MLAT), or data from the camera sensors where the sensors have the capability to derive surveillance data.

2   General Requirements

2.1   **Change Management**. Each proposed aerodrome remote tower installation, regardless of operating mode is to satisfy the requirements for the introduction of a new ATS system or for a change to an existing ATS system as described in GM RAATS[3] and CAP 670[4]. The CAA will provide advice and guidance to ANSPs seeking to introduce an aerodrome remote tower but, in principle, extant change management requirements apply and must be complied with. When planning the aerodrome remote tower, ANSPs should also consider the level of change and technology being

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[2] EUROCAE ED-240A - Minimum Aviation System Performance Standards (MASPS) for Remote Tower Optical Systems.
[3] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) Chapter 6**
[4] **CAP 670 ATS Safety Requirements Appendix B**.

introduced to the controlling environment and the relationship with the human operator. Advice and guidance on how this may be achieved can be found in the ATM Automation Manual[5].

2.2 **Transition Plan**. The ATS provider should establish a transition plan which describes how the operation will migrate from the conventional tower to the remote site [6].

2.3 **Safety Case.** Any related safety assurance documents must be completed and submitted in accordance with the requirements laid down in UK Reg (EU) 2017/373[7] and CAP 670[8].

2.4 **Operational impact**. Any operational aspects should already conform to MATS Part 1 and these operational aspects should migrate to the aerodrome RTM without modification. It is additionally recommended[9] that "the ATS provider should identify the particular configuration of the RTM and the related operating methods, taking into consideration the operational application and the particular needs of the aerodrome(s), in such a way that the ATCOs/AFISOs are enabled to fulfil their responsibilities as if the service would be provided from a conventional tower''.

2.5 **ATS Personnel Licensing and Training.** CAA policy for aerodrome remote towers does not require any changes to the existing licensing and training arrangements for ATCOs, see UK Reg (EU) 2015/340[10] and GM RAATS[11] . For AFISO licensing requirements see CAP 1032[12].

2.6 **Operational and system considerations.** GM RAATS[13] addresses all aspects of the operation and use of visual surveillance systems.

2.7 **Visual Presentation Equipment Interoperability.** Electro-optical equipment (cameras) and the associated visual presentation equipment (displays) are included within the scope of CAP 670[14], and are considered as systems and procedures for ATS.

3 Specific Considerations

3.1 **Human Factors (HF).** When considering an aerodrome remote tower project, it is important for aerodrome operators and ATS providers to consider the impact and implications on all of the people, equipment involved individually in the system, and as a whole working system. From a HF standpoint, this would include the whole organisation, how it interacts internally and externally and how those interactions would be affected by a change. It is important to consider the local rationality principle; to include all of the people involved in the system (for example ATCOs, Engineers, Air Traffic Safety Electronics Personnel (ATSEPs) and those who physically work at the airport), and to involve them in the design and implementation work for the remote

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[5] **CAP 1377 ATM Automation: Guidance on human technology integration**
[6] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) - paragraph 6.3**
[7] **UK Reg (EU) 2017/373 Annex IV ATS.OR.205 Safety assessment and assurance of changes to the functional system**
[8] **CAP 670 ATS Safety Requirements; Appendix B to SW01**
[9] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) Paragraph 3.5**
[10] **UK Reg (EU) 2015/340 Annex 1 PART ATCO**
[11] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) Paragraph 10**
[12] **CAP 1032 Aerodrome Flight Information Service Officer Licensing**
[13] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) Paragraph 5.2**
[14] **CAP 670 – Remote Tower Optical Systems Part 1 Requirements**

tower. Alongside the safety management of change processes, the psychological impacts of change on all the people in the system should also be considered.   Additional specific guidance on HF assessment is listed at GM RAATS[15] .

3.2 **ATS personnel ongoing familiarity with on-site services/personnel.** Following any move of ATS staff to an aerodrome remote tower facility, it will be necessary to develop a means by which relationships can be developed and maintained with on-site aerodrome staff and services.

3.3 **Provision and assurance of meteorological services.**   See **Appendix E, Appendix F** and GM RAATS[16].

3.4 **Other Ancillary Services.**   Remote tower implementation projects shall include arrangements for continuing provision of those ancillary services/activities (other than ATS provision to aircraft) previously undertaken by ATS staff at the affected aerodrome. If necessary, pre-existing procedures shall be reviewed to reflect any differences arising from operating the service whilst the ATS service is provided remotely. Examples include:

   a.   Airfield driver training/validation

   b.   Control of grass cutting/snow clearance/general aerodrome work in progress.

   c.   Management of aerodrome emergency resources and relationships (in terms of crash and disaster plans) with local emergency services.

   Note: See also GM RAATS[17]

3.5 **Security.**   Physical and cyber security of the equipment is to be assured. Guidance and advice on cyber security related issues is available in CAP 1753[18] .

3.6 **Service Availability, Continuity and Integrity.**   The safety rationale for aerodrome remote tower implementation shall include, but not be limited to the following:

   a.   Continuity of service - system design should consider service continuity and availability requirements as well as system safety requirements. See GM RAATS[19].

   b.   Failure modes and mitigation of system failure(s). More detail is at GM RAATS[20].

   c.   Failure detection: Generate alarms and warnings when failures have been detected.

   d.   The means by which management of aircraft, vehicles and pedestrians is exercised when one or all of the systems fail and how to transition from working system(s) to failed system(s) (e.g. the use of emergency communications for safe termination of service as required by CAP 670 ATS Safety Requirements). What mitigations are required to continue or cease operations?

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[15] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2), paragraph 6.2**.
[16] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2), paragraph 5.8.**
[17] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2), paragraph 5.7.2**.
[18] **CAP1753: CAA Cyber security oversight process for aviation**
[19] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2), chapter 5 paragraph 10**
[20] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2), chapter 5 paragraph 11**

e. Restoration of services (e.g. by means of contingency facilities in the event of failure of the primary facility).

3.7 **CNS considerations.** The requirements of CAP 670 ATS Safety Requirements. apply to the provision of remoted communications, surveillance systems and the status of CNS facilities, however the following should also be considered:

a. Voice and Data:

   i. How is the fidelity of signals assured?

   ii. How are signals protected from interference?

   iii. What back-up facilities will be in place and what procedures will be established in the event of loss/corruption of signals?

b. Replication of the audio environment. Over the years the constructors of ATS towers have attempted to sanitise the control position and reduce noise as much as possible however, a level of aerodrome audio can assist in situational awareness. The ANSP shall therefore, consider what level of ambient sound to provide.

c. The interdependence between CNS elements and potential common mode failures shall be highlighted and mitigation provided where appropriate.

d. Any physical restrictions on the quality or quantity of the images transmitted due to, for example, bandwidth; a lower bandwidth may not be capable of transmitting 'higher' video update rates. Irrespective of the video update rate the ANSP shall consider the associated human factors (HF) impacts and mitigate for them.

e. The latency of different systems shall be considered together.

f. Camera specifications as detailed at EUROCAE ED-240A - Minimum Aviation System Performance Standards (MASPS) for Remote Tower Optical Systems. These relate to the provision of an ATS service. If cameras are to be used for remote meteorological observations, additional consideration must be given to the suitability of the cameras for that purpose (see Appendix E).

g. The ANSP, together with the Aerodrome Operator also is to consider camera mounting arrangements, including (but not limited to) the following:

   i. The design shall address the camera tower strength/frangibility, stability and wind loading requirements associated with the aerodrome operation.

   ii. Camera mounting structure (e.g. camera tower) security.

   iii. Camera mounting structure safeguarding.

   iv. Camera mounting structure intrusion into obstacle planes.

   v. Camera resilience - weather; birds; age; replacement/maintenance (including cleaning) schedule(s).

h. The recording of the Visual Presentation Displays and aerodrome ambient audio is recommended (see GM RAATS[21]). Where the overlay and/or integration of

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[21] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2), chapter 5 paragraph 6**

surveillance data is used, the recording of the displays shall comply with the requirements for At-The-Glass (ATG) Surveillance data contained in CAP 670[22].

i. Most aerodromes will have some form of on-site ATS engineering capability. With an aerodrome remote tower, this may be required to:

   i. Remain on site; or

   ii. This may become a remotely shared resource. If remotely based, a system must be established providing a Service Level Agreement (SLA) for maintenance of facilities and for response to failures. Priorities for each facility will need to be produced and robust contingency measures established.

   Note: See also GM RAATS[23].

3.8 **Signal lights and pyrotechnic signal provision**:

   a. How will pyrotechnic and light signals be replicated in a remote environment?

   b. How will they be controlled by ATS and where on the airfield will this additional system be located?

   Note: See also GM RAATS[24].

3.9 **Aeronautical Information**.   The Aerodrome Operator is to ensure that:

   a. The remote status of ATS provision is annotated at AD-2-EGxx-2.23.

   b. That the location of the primary remote tower camera mast is clearly marked on the aerodrome chart at AD-2-EGxx-2-1 by means of the symbol

   ☼

   with the annotation

   'R-TWR'.

   This reflects the mast (when one is considered necessary) where the Signal Light Gun (SLG) is housed.

   c. The location of the signalling lamp should be included in AIP AD 2.23 'Additional information'. (e.g. the phrase 'Signalling lamp positioned at [geographical fix]' plus a clear indication of the signalling lamp location using the symbol/annotation on the aerodrome chart as addressed at 3.9b above).

4 Operational Approval

4.1 CAA aerodrome remote tower approvals will follow extant practices contained within CAP 670 ATS Safety Requirements.

4.2 ANSPs wishing to provide remote ancillary services other than ATS may require additional approvals. For example, remote meteorological service provision must

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[22] **CAP 670 ATS Safety Requirements SUR10**
[23] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2), chapter 5 paragraph 11**
[24] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2), chapter 5, paragraph 5.3**

comply with the requirements in CAP 746[25] Requirements for Meteorological Observations at Aerodromes and also at **Appendix E** and **Appendix F**. They will require additional approval from the CAA to provide aerodrome observations from a remote location.

Note: - ANSPs wishing to provide a remote aerodrome meteorological observing service should consult with the UK Meteorology Authority at an early stage.

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[25] **CAP 746 Requirements for meteorological observations at aerodromes**

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APPENDIX A

Specific Requirements for RAATS with basic equipage.

A1   The following requirements are specific to 'basic equipage' of any RTM whether operating in single or multiple mode of operation.

A2   Any RTM that is equipped with basic equipage that operates in dedicated single mode where a single dedicated RTM is used to provide ATS exclusively for only one aerodrome shall implement the requirements in sections 2 and 3.

A3   Any RTM that has non-simultaneous Multiple site control with a single RTM that operate in basic mode, shall implement the additional requirements in Annex D.

A4   In addition to the requirements in sections 2 and 3 of this document, any RTM that operates in multiple mode of operation that operates with basic equipage shall also satisfy the requirements detailed in Annex E.

A5   Additional guidance can be found in GM RAATS [26]

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[26] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2), chapter 3.**

APPENDIX B

Specific Requirements for RAATS with enhanced equipage

B1   Equipage and overlays

B1.1   The SESAR division[27] of basic and enhanced equipage; overlaid information is considered to be an enhanced feature with the exception of status information (as described at paragraph 1.3).   The CAA further divides overlaid information into two categories - air traffic surveillance and non-surveillance derived information.

B1.2   Any RTM that is operated with enhanced equipage shall implement the requirements in Sections 2 and 3 of this policy document plus the specific requirements for enhanced equipage.

B1.3   Enhanced equipage includes features incorporating a variety of both static and surveillance-derived dynamic overlays, examples of which are listed at paragraph 1.3.

B1.4   Implementation of the various enhancements and their use will be considered and approved on a case-by-case basis.

B2   Recording of the Visual Presentation

B2.1   The visual presentation screens together with aerodrome ambient sound reproduction (if used) shall be recorded where any of the advanced features are used as part of ATS provision.

B2.2   Recording and replay requirements will be incorporated into CAP 670, based on SUR10.

B3   Additional Surveillance Recording Requirements

B3.1   In addition to the requirements for recording the visual presentation, the recording and replay requirements in CAP 670 SUR 10 shall apply to any ATS surveillance equipment approved for use in a remote tower.[28]

B4   Surveillance Features

B4.1   ATS surveillance-derived information can be overlaid or integrated as enhanced equipage in a remote tower. Displaying of surveillance-derived data on the visual presentation displays may enhance situational awareness by improved acquisition of targets normally acquired visually and complement existing surveillance displays being used in a control tower. The display of surveillance-derived data should be optional and selectable as required.

B4.2   There are various surveillance functionalities that can be integrated into a remote tower environment. The CAA will assess the various surveillance features on a case by case basis in the remote tower approval process. The following paragraphs detail requirements for specific surveillance functionalities.

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[27] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) Paragraph 12.4**
[28] **CAP 670 - Part C, Section 5: Remote Tower Optical Systems**

B5   Image Processing

B5.1 Where image processing algorithms are used for the recognition of objects, these shall be able to successfully distinguish between aircraft, vehicles and other objects such as humans or wildlife.

B5.2 Highlighting or framing functions shall use different symbols and/or colour schemes in order to appropriately distinguish between categories of objects.

B5.3 Image processing capabilities used for the automatic identification of objects shall be able to appropriately identify the object; all automatic identification mechanisms shall be clearly defined and assured and verified through testing.

B6   Data Sources and Applicable Functional and Performance Requirements

B6.1 Surveillance data displayed on the remote tower visual presentation displays or other surveillance displays such as an Air Traffic Monitor (ATM), Surface Movement Radar (SMR) display, or Advanced Surface Movement Guidance and Control System (A-SMGCS) display could be derived from one or more of these sources:

   a.   Data obtained from video camera, infra-red and/or other sensors installed on or in the vicinity of the aerodrome.

   b.   Integrated surveillance data from conventional surveillance sources such as conventional SSR, multilateration (MLAT) and Automatic Dependent Surveillance – Broadcast (ADS–B).

   c.   Integrated surveillance data shall be limited to that considered necessary for safe undertaking of the ATS function. Position history trail dots derived from conventional surveillance data sources shall not be displayed on visual presentation displays.

B6.2 Information associated with target labels for aircraft shall include aircraft identification and when applicable, altitude. A human factors assessment shall be carried out to ensure that all target labels are suitable (reference section B12).

   a.   The label size shall be limited so not to obscure any objects in the remote tower visual presentation display.

   b.   Labels shall be clear in both day and night-time conditions.

   c.   The position accuracy of data derived from conventional surveillance sources incorporated into the visual presentation shall enable immediate and accurate correlation by remote tower ATS personnel between an object and the data label associated with it.

   d.   The colour scheme to be used for integrated surveillance data labels, text and symbols, including those displayed when utilising infrared camera imagery at night or by day in low visibility conditions is to be appropriate to the operational task.

   e.   The option to switch off surveillance data labels when necessary shall be available.

B6.3 Where identification and position data is derived from the video camera sensors, the camera sensors shall be considered to be ATS surveillance sensors.

B6.4 Where visual or infrared camera sensors are used for deriving and displaying surveillance data (either on the visual presentation or on surface movement displays), the equivalent performance requirements expected of conventional technologies for surface applications (such as MLAT or SMR) shall apply.

B6.5   The performance requirements applicable to sensors used for surface surveillance can be found in CAP670 SUR 09.

B6.6   EUROCAE ED-87 details Minimum Aviation System Performance Specifications for A-SMGCS levels 1 and 2.

B6.7   EUROCAE ED-117 details Minimum Operational Performance Specification for Mode-S multilateration systems for use in A-SMGCS.

B7   Data Transmission

B7.1   CAP 670 SUR 03 requirements shall apply to the data transmission links used to pass data from the surveillance sensors (from which ATS surveillance data is derived) into the surveillance equipment used in the remote tower.

B7.2   The latency of the surveillance data transmitted from the airfield-based sensors or from any onward-routed surveillance data feed shall be defined and verified.

B8   ATM use in remote towers

B8.1   Surveillance-derived data represented on the visual presentation displays shall not replace the ATM surveillance display equipment used in an aerodrome ATC environment.

B8.2   In the event of a temporary loss of the ATM display, it may be possible to utilise the limited surveillance data represented on the visual presentation displays to help effectively manage air traffic in a contingency situation

B8.3   CAP 670 SUR 08 requirements shall apply to any ATM used in a remote tower environment.

B9   SMR/SMGCS or A-SMGCS use in remote towers

B9.1   Surveillance-derived data represented on the visual presentation displays shall not replace A-SMGCS or SMR-based surface surveillance display equipment when used in an aerodrome ATC environment.

B9.2   In the event of temporary failure of an A-SMGCS or an SMR-based surface surveillance display utilised in a remote tower, it may be possible to utilise the limited surveillance data represented on the visual presentation displays to help effectively manage air traffic in a contingency situation.

B9.3   Where surveillance-derived data augments visual presentation displays, the functions and the purposes for which they are intended to be used shall be clearly identified, assured and approved.

B9.4   It is recommended that moving objects that are not aircraft or vehicles (e.g. birds) should not be displayed on the visual presentation unless detected by camera sensors and image processing.

B10   Visual presentation display failure

B10.1 In the event of failure of all remote tower camera sensors, surveillance-derived data overlays on the visual presentation shall not be used.

B11   Safety Nets and Alerting Functions

B11.1 Where SMR and/or A-SMGCS is used for surface traffic monitoring in remote towers, the safety nets on the visual presentation displays should be disabled where necessary to avoid multiple audio alarms being active at the same time.

B11.2 In the absence of an SMR/SMGCS or an A-SMGCS the use of safety net alerts on the visual presentation displays may be allowed provided that the accuracy, precision of the data and the rate of nuisance alert levels in the integrated remote tower system is acceptable. Each integrated system and its associated safety net functionalities will be considered by the CAA on a case by case basis depending on the system capability.

B12   Human Factors

B12.1 A human factors assessment shall be carried out to ensure that all overlays (including labels, symbols, colour schemes, highlighting or framing), and any safety nets used are suitable.

B12.2 For further information see GM RAATS[29]

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[29] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) paragraph 6.2.2.**

APPENDIX C

Requirements for Non-Simultaneous Single Mode operations from a single RTM with basic or enhanced equipage.

C1   Once a specific aerodrome location is selected at an RTM serving several aerodromes but operated in single mode, this selection is to be locked to that aerodrome to prevent inadvertent selection of another aerodrome during operations.

C2   The selected aerodrome shall only be operated in single mode with those enhancements that have been approved for that aerodrome.

C3   During the period of service provision to the selected aerodrome, specific enhancements applicable to other aerodromes must be locked out.

C4   The number of aerodromes and the equipage levels applicable to each of them under this mode of operation will be considered and approved by the CAA on a case-by-case basis.

C5   Considerations for switching between different aerodromes having the same equipage level and for switching between aerodromes having different equipage/features levels. See GM RAATS[30]

C6   Considerations for switching between aerodromes having different equipage/features levels. See GM RAATS[31]

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[30] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) paragraph 4.1.2**
[31] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) paragraph 4.2.3**

APPENDIX D

Requirements for simultaneous multi-site control from a single RTM with basic or enhanced equipage/features.

Appendix D to the Policy for the Approval of Aerodrome Remote Towers is currently under development within CAP 670 RT01 – RT03. Once that development is complete, Appendix D will be entirely referenced to that document.

APPENDIX E

Ancillary Services

E1   Specific Requirements for the establishment of a Remote Aerodrome Meteorological Observing Service (RAMOS).

E1.1   In order to gain approval for the provision of a RAMOS, ANSPs must provide assurance that accurate, timely and complete aerodrome meteorological observations can be provided from the remote location.

E1.2   The ANSP should review the unit's quality management system to ensure that it includes an appropriate level of detail of the system that assures users that the quality of meteorological information supplied by the RAMOS complies with regulatory requirements.

E1.3   Consideration must be given to any potential differences in the processes, procedures or techniques for observing, reporting, recording and disseminating observations both 'within' and beyond the aerodrome when operating a RAMOS. Particular consideration should be given to the following areas:

   a.   When observing at an aerodrome it is often difficult for an observer to determine certain weather conditions (e.g. precipitation type and intensity) without observing from outside the building. How will observers assess those elements which would normally be assessed from an outside position when observing at a remote location?

   b.   A review of Met training for ATS personnel and/or accredited observers (and other personnel if necessary) will be needed to ensure that training syllabi and competency checks are updated where necessary to reflect any differences in the provision of a RAMOS. See **Appendix F Paragraph F6** for further details regarding MET Observer Training Requirements.

E1.4   There are some differences in the requirements for the 'out of the window' view required for ATS provision and that required for Met provision. The camera(s) specification detailed in MATS Part 1 is for the provision of an ATS service. For camera(s) that are to be used for remote Met observing additional consideration must be given to the suitability (performance), number, and location of cameras to ensure that the remote display enables observations to be provided that give the best approximation of the actual conditions consistent with those that would be seen "out-of-the-window" at the aerodrome (in all levels of light and weather conditions). Particular consideration should be given to the following areas:

   a.   During the hours of darkness cameras may not be able to distinguish the amount and type of cloud present, or the type and intensity of precipitation. Evidence will be required to ensure cloud observations during the hours of darkness can be made using remote technology. For example, some States use Infra-Red cameras specifically for Met observing at night.

   b.   Cameras must be in a position, and at a height, that enables them to supply observers with views which are representative of the aerodrome and its vicinity, and which provide a good view of the celestial dome. Additional cameras may be required to obtain the necessary view(s), for example in low visibility.

E1.5   Site-specific weather information is important in the production of Aerodrome Forecasts (TAF) because it assists meteorologists in maintaining the accuracy of forecasts, and ANSPs should consider the possibility of making real-time camera images available to their associated aerodrome meteorological office.

E1.6 Automated sensors used to measure certain meteorological elements (typically visibility, present weather and cloud) shall be considered to be an aid to an observer rather than a direct source of information. Such sensors can measure each of these elements but are limited by the spatial coverage of the sensor and the capability to resolve certain weather phenomena. Subject to the outcome of the assessment of the suitability of cameras for remote observing ANSPs shall consider whether additional sensors will be required to provide mitigation for any limitations in the camera view and/or the limited spatial coverage of certain Met sensors.

E1.7 Contingency arrangements for all parts of the remote Met service shall be reviewed and procedures updated if necessary.

E1.8 RAMOS will require a period of testing to ensure parity with the service currently provided at the aerodrome. The test period should include the widest possible range of conditions, specifically the more hazardous weather conditions (e.g. fog, snow, thunderstorms etc.). The duration of the test and the weather phenomena that need to be witnessed will need to be discussed but ANSPs should plan to conduct testing over a period of 6 months (to include winter).

E1.9 It is recommended that ANSPs consider industry best practices in the area of RAMOS, for example, by reviewing RAMOS operations and experiences in the UK and other States and by investigating any equipment that has specifically been designed to support remote observing operations.

E2   Management of Aerodrome Driving

E2.1 At aerodromes where ATC has responsibility for airside driver training, examination and ongoing competence, arrangements will need to be in place for these functions to be conducted by other suitably qualified on-site aerodrome staff.

E3   Aerodrome Wildlife Management

E3.1 At aerodromes where wildlife management is a function of ATC, careful consideration will be necessary to determine which elements, if any, can be managed from the remote ATC facility and which will need to be delegated to suitably qualified on-site aerodrome staff.

E4   Aerodrome Surface Inspections

E4.1 At aerodromes where ATC has responsibility for conducting and/or overseeing surface inspections, arrangements will need to be in place for suitably qualified on-site aerodrome staff to assume the elements of this task which will need to remain on-site.

E5   Collection of Fees

E5.1 At aerodromes where ATC has responsibility for the collection of aircraft fees, arrangements will need to be in place for this function to be conducted by remaining on-site aerodrome staff.

E6   Airfield Briefings

E6.1 At aerodromes where airside safety briefings and/or training is conducted by ATC, suitably qualified on-site aerodrome staff will be required to assume the elements of this training which will need to remain on-site.

E6.2 These briefings could include, but not be limited too; daily operational briefing, work in progress, and contractor airside awareness briefings.

APPENDIX F

Personnel Training and Licensing

F1   ATC Training Requirements

F1.1 UK Reg (EU) 2015/340[32] ATCO.D.55[33]; ATCO.D.60[34] and ATCO.D.85[35] detail technical requirements and administrative procedures relating to ATCOs' licences and certificates.

F1.2 Unit Training Plan

    a.   The required content of a unit training plan is detailed within ATCO.D.055.

    b.   A remote tower centre (RTC) may be considered as one air traffic control (ATC) unit, therefore requiring one-unit training plan.

    c.   The unit training plan of an RTC should include the list of the unit endorsement courses for all aerodromes, to which the RTC is providing a service.

F1.3 Conversion Training

    a.   ATCO training requirements for the transition of service provision between conventional and remote tower operations shall be in accordance with, ATCO.D.085.

    b.   A Conversion Training plan shall be submitted to and approved by the CAA.

    c.   Conversion Training shall be provided before ATCOs exercise the privileges of their licence in the changed operational environment.

    d.   GM1 ATCO.D.085 contains additional guidance on the expected content of the conversion training plan.

    e.   Conversion training for ATCOs providing remote aerodrome air traffic services

        i.   In case of a transition from a 'conventional tower' to a 'remote tower' the conversion training for ATCOs should at least include the items listed in GM3 ATCO.D.060(c) , and if applicable to multiple modes of operation, the items listed in GM4 ATCO.D.060(c).

        ii.   It is recommended that a period of dual operation be scheduled as part of the conversion training plan to validate assumptions made in the associated safety assessment with regards to displayed view, target acquisition etc

        iii.   In case of a transition from a 'remote tower' to a 'conventional tower', the training organisation should consider possible training needs, if appropriate, required by the change of operational environment.

        iv.   In case of a transition from 'single mode of operation' to 'multiple mode of operation', the conversion training for ATCOs should at least include the items listed in GM4 ATCO.D.060(c).

F1.4 Unit Endorsement Course

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[32] **UK Reg (EU) 2015/340**
[33] **UK Reg (EU) 2015/340 ATCO.D.55 GM 3 & 4**
[34] **UK Reg (EU) 2015/340 ATCO.D.60**
[35] **UK Reg (EU) 2015/340 GM 1 ATCO.D.85**

a. Guidance on the content of unit endorsement courses applicable at a remote tower facility is detailed within GM3 ATCO.D.60(c)[36.].

b. The unit endorsement course should enable ATCOs providing aerodrome control service from a 'remote tower' to acquire knowledge of the concept of remote aerodrome air traffic services and of the characteristics of the operating environment, to appreciate the necessity to consider the specific human factors influence on the remote aerodrome air traffic services, as well as to recognise specific abnormal situations and to manage their impact.

c. This could be achieved by addressing the following items:

  i. Introduction to remote aerodrome air traffic services

  ii. Concept of remote aerodrome air traffic services

  iii. 'RTMs

  iv. 'RTC

  v. Technical enablers used for remote aerodrome air traffic services

  vi. Operational applications

  vii. Operating environment

  viii. Configuration of the RTM and RTC (if applicable) and modes of operation

  ix. Visual presentation

  x. layout and orientation;

  xi. technical capabilities and limitations of a 'visual surveillance system' including:

    1. impact of weather conditions on site the aerodrome;

    2. end-to-end delay;

    3. frame rate,

    4. any differences in light conditions between the aerodrome and the visual presentation;

    5. 'dead' pixels;

    6. any overlaid information and any site-specific equipment/functions such as sun filters; and

    7. seasonal settings.

    8. Set-up and characteristics of the local equipment at the aerodrome, e.g. location of cameras, signalling lamp, etc.

    9. Familiarisation with the physical aerodrome(s) environment and the different local stakeholders via liaison visit(s)

    10. Local weather characteristics

    11. Human factors aspects

    12. Human factors influence on remote aerodrome air traffic services

  xii. Rostering arrangements e.g. Additional unit endorsements at a remote tower centre.

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[36] **UK Reg (EU) 2015/340 GM3 ATCO.D.60(c)**

1. Factors that can generate fatigue in a 'remote tower' environment for example:

    a. eye strain caused by the performance of the visual presentation or by contrast in lighting against the background;

    b. artificial light and/or lack of daylight in the RTM)

    c. Preventing and mitigating strategies on fatigue.

2. Procedures for degraded modes, for example:

    a. Complete or partial loss of the visual presentation,

Note: such loss may not be apparent to other stakeholder e.g. operations staff, pilots and additional mitigations required.

    b. Corrupt, delayed or frozen image

    c. Loss or degradation of the 'binocular functionality'

d. Multiple Mode of Operation

    i. When performing 'multiple mode of operation', the following items should also be considered:

        1. Use of communication facilities (e.g. aeronautical mobile service, aeronautical fixed service and surface movement control service) for simultaneous provision of air traffic services in geographically separated areas of responsibility

        2. Applicable procedures for traffic management, such as traffic prioritisation, enabling multiple mode of operation

        3. Procedures for prioritising between aerodromes

        4. Procedures for the transferring/merging/splitting of aerodromes in an RTM[37]

        5. Different weather and light conditions at different aerodromes

        6. Human capabilities/limitations with regard to the simultaneous handling of more than one aerodrome and distribution of attention

F2   ATCO Competence requirements

F2.1 ATCO competence requirements are to be detailed within the Unit Competence Scheme.

    a. Where a remote tower facility is utilized as a contingency facility, the unit competence scheme shall detail the process by which currency is to be maintained.

F2.2 The Unit Competence Scheme should detail the process which specifies, facilitates and records, liaison with, and knowledge of, the physical Aerodrome environment.

F3   ATCO Licensing requirements

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[37] **ADR – Aerodromes: Remote Tower Operations GM (Issue 2) paragraph 4.2.3**

F3.1 Unit Endorsements.

    a.   When an aerodrome control service is provided from a remote tower facility serving multiple sites, each aerodrome for which the service is provided should constitute its own unit endorsement.

    b.   Where an aerodrome control service can be provided from both a conventional and remote tower facility, other than for contingency purposes, the unit endorsement will identify the operating positions from which the service may be provided.

    c.   Where a remote tower facility is utilized as a contingency facility, the ATCO licence ADI unit endorsement for service provision from the conventional facility will also apply to the remote tower facility.

        i.   Consideration should be given to currency requirements supporting operations in the contingency facility, which will be dependent on equipment, capacity and complexity.

F4   AFISO Training Requirements

F4.1 Whilst AFISO training and competence lies outside of the remit of UK Reg (EU) 2015/340[38], it is considered likely that the concept of operation and therefore training and conversion processes will broadly align with those detailed within this annex. It is recommended that ANSP's utilise a similar framework when developing the safety case and change management mitigations required by UK Reg (EU) 2015/340[39].

F5   Support Personnel training requirements

Text to be developed

F6   MET Observing

F6.1 MET Observer Training Requirements

a.   Annex V to the ATM/ANS IR[39] requires that service provider's staff providing the MET observing service shall have and maintain adequate technical and operational expertise.

    b.   Official Meteorological Reports (produced by Meteorological Service Providers certified under Annex V to the ATM/ANS IR[39] as an ANSP which, if in the form of a meteorological aerodrome report (METAR), may be disseminated beyond an aerodrome to pilots and other meteorological service providers using processes that adhere to ICAO Standards. An observer shall be accredited and competent to produce these observations.

    c.   Local Routine and Local Special Reports (produced by Meteorological Service Providers certified under Annex V to the ATM/ANS IR [40] as an ANSP) that are not disseminated beyond the aerodrome. MET observers must have a Basic Meteorological Observing competency.

    d.   Details on MET observer training and competency requirements are published in CAP 746[40].

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[38] **UK Reg (EU) 2015/340**
[39] **UK Reg (EU) 2017/373 Annex V** Part-MET
[40] **CAP 746 Requirements for meteorological observations at aerodromes**

e. Should an aerodrome wish to provide a Remote Aerodrome Meteorological Observing Service the permission of the CAA is required and the CAA will require assurance that the service provider has carried out a review of Unit Met training and competency assessments for ATS personnel and/or accredited observers (and other personnel if applicable) to ensure that training syllabi and competency checks are updated where necessary to reflect any differences in the provision of a RAMOS.

F6.2 MET Observer Conversion Training

a. MET Observer accreditation may only be transferred to a Remote Aerodrome Meteorological Observing Service once the service provider has ensured that the observer has been provided with sufficient training to ensure that the observer can competently use the remote observing equipment.

b. Training and competency assessments of Remote Aerodrome Meteorological Observers (RAMO) should, as a minimum, take account of the following:

   i. Knowing and using the features and settings of the cameras and other remote observing equipment to best advantage.

   ii. Understanding and accounting for the differences between the camera images and the image that is seen by the human eye.

   iii. Understanding and accounting for the limitations of the camera and other remote observing equipment.

   iv. Understanding the advantages and disadvantages of the location (height and view) of the camera and other remote observing equipment.

   v. Remote observing contingency arrangements.

c. Appropriate competency assessments must be carried out to ensure that MET observers are familiar with remote observing equipment, processes and procedures before commencing unsupervised operational remote observing duties.

F6.3 Multiple Mode of Remote Met Observing Operation

a. The CAA will require additional assurances in support of requests to operate a Multiple Mode of MET observing operation. Where applicable this should include addressing factors as described in F 1.4.a, and if, or as, necessary specific factors relating to MET service provision including consideration of:

   i. Understanding how routine observations from multiple sites will be made and disseminated in a timely manner, and

   ii. How a continuous weather watch will be maintained for multiple sites.

F6.4 MET Observer Ongoing Competency Assessments

a. Every accredited observer should be assessed on an annual basis by the Manager, or other nominated representative, of the Aerodrome Met Observing Service Provider to ensure the observer's ongoing competence.

b. The Unit's competency scheme must be reviewed and updated as applicable to reflect the competencies required to perform remote observing duties where appropriate including, as a minimum, the items listed in F.6.2.b.

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APPENDIX G

Parallel/Multiple co-located Runway Operations

Text to be developed