Airspace Regulation

Air traffic control surveillance minimum altitude chart

CAP 777

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Contents

Chapter 1

General principles

Definition

The UK defines a Surveillance Minimum Altitude Area (SMAA) as follows:

- 'A Surveillance Minimum Altitude Area is a defined area in the vicinity of an aerodrome, in which the minimum safe levels allocated by a controller vectoring IFR flights with Primary and/or Secondary Surveillance RADAR equipment have been predetermined.'

It should be noted this definition reflects the UK application of the ICAO procedures based on tactical vectoring described in ICAO Documentation (Doc. 4444 PANS-ATM Chapter 8 and Doc. 8168 PANS-OPS, Volume II, Part II, Section II Chapter 6).

Details of published SMAAs are in the AD 2 section of the UK AIP.

The SMAAs and associated detail are commonly referred to as an 'ATCSMAC' (Air Traffic Control Surveillance Minimum Altitude Chart). Historically known as Radar Vectoring Area (RVA) charts, ATCSMACs are an ICAO requirement and further detail can be found in ICAO Annex 4, Chapter 21.

Responsibility

The Airspace Regulation Section of the UK CAA is responsible for ATCSMAC policy and specification, both of which are based on ICAO standards. Additionally the Airspace Regulation Section is required to approve any new ATCSMAC design, any periodic ATCSMAC review or any request to amend the operational element of an existing ATCSMAC. This operational element is detailed further in Chapter 3.

The aerodrome licence holder is responsible for the ATCSMAC. The aerodrome licence holder or representative acting on the licence holder's behalf is responsible for the initial design, routine maintenance and periodic review of their aerodrome's ATCSMAC. They will be referred to as the 'Sponsor' throughout this document. The

ANSP responsible for providing ATC for the airport shall be consulted regarding any proposed amendments to the ATCSMAC.

An Approved Procedure Designer (APD) shall be contracted by the Sponsor to carry out any new ATCSMAC design, any periodic ATCSMAC review or any request to amend the operational element of an existing ATCSMAC.

ATCSMACs will remain valid for a maximum period of five years and a review should be aligned with a review of the other Instrument Flight Procedures at the aerodrome. Operational or non-operational amendments should also be issued at any time when significant change occurs, however these changes if promulgated in isolation will not constitute a periodic review.

Purpose of an SMAA

The purpose of an SMAA is:

1. To relieve controllers of the responsibility for determining the appropriate minimum safe levels in the vicinity of the aerodrome, where the sequencing and separation of arriving IFR flights to comply with the UK requirement that aircraft shall be vectored to join final approach at no less than 5 NM from touchdown.
2. To provide pilots with an indication of the minimum altitudes which ATC will allocate when vectoring an aircraft below the published Minimum Sector Altitude (MSA).

It is important to recognise that the designated SMAA may not be the only area within which vectoring may take place. When vectoring flights outside the SMAA, the controller is responsible for determining and providing the required terrain clearance as specified in CAP 493, Manual of Air Traffic Services Part 1.

It should be recognised that traffic may not be allowed to operate within certain portions of an SMAA, such as Prohibited, Restricted or notified Danger Areas. These areas shall be shown on the ATCSMAC.

SMAAs do not constitute controlled airspace nor do they attract any special airspace regulation in their own right.

Descent below SMAA (FAVA)

The minimum altitudes available within the SMAA sector should be adequate to permit vectoring of an aircraft to the final approach of a published IAP inc. Surveillance RADAR approach. However, there may be circumstances where further descent below the SMAA, either on the final approach track, or while establishing on the final approach track, provides operational flexibility. The area that provides this facility is known as Final Approach Vectoring Area (FAVA).

The dimensions of the nominal standard FAVAs are shown at Appendices A and B.

FAVAs should be shown for all runways where applicable, however, to simplify the ATCSMAC, FAVAs need not be shown if there is no difference between the minimum levels depicted and that of the SMAA itself.

Terrain clearance criteria

The minimum altitude available to ATC for vectoring arriving flights within an SMAA sector is 300m (984ft) above the highest (dominant) obstacle.

To determine the minimum altitude available within an SMAA sector, all obstacles within the sector and the extended Primary SMAA buffer (PSB) should be identified. The width of the PSB is dependent on the Surveillance RADAR lateral separation certified for use with the ATCSMAC, i.e. 3NM or 5NM. The PSB also requires a full Minimum Obstacle Clearance (MOC) value of 300m (984ft).

The addition of 300m (984ft) feet to the elevation of the highest obstacle within the resultant area will determine the minimum initial altitude available. The resultant figure is then rounded up to the next (higher) 100ft interval. See Appendix C.

Where operationally desirable, the SMAA may be split into two or more sectors to provide relief from obstacles that would affect only one runway circuit direction. A complex sector arrangement which might be difficult for flight crew or controllers to assimilate should be avoided.

Instrument Approach Procedure (IAP) Minimum Sector Altitudes (MSAs) shall be shown on the ATCSMAC to indicate the minimum level that should be attained by

aircraft intentionally leaving the SMAA. The ATCSMAC shall state which reference Navaid is utilised by the IAPs to ascertain the MSAs. If an airport has multiple procedures referenced to differing reference Navaids then the highest MSA values are to be applied.

Contingency ATCSMAC planning

Occasionally an outage, withdrawal or reduction of an airport's Surveillance RADAR service may occur.

Short-term unplanned outages are not considered within the remit of this document. In such situations the ATCSMAC is invalid and the Sponsor will apply locally specified contingency procedures. However, the Sponsor is required to inform Airspace Regulation if a short-term unplanned outage is likely to continue for an extended period. If this is the case, the contingency plans for planned long-term outages as detailed below should be adopted.

Outages that may occur due to the renewal or replacement of equipment are likely to extend over a prolonged period. In such instances it may be operationally undesirable to revert to the published MSA. Consequently the Sponsor may consider the implementation of a contingency ATCSMAC plan if an alternative, appropriate Surveillance RADAR facility is available for the duration of the outage.

These longer-term outages will require careful planning and Airspace Regulation should be notified at the earliest opportunity, so as to assist in the implementation of a contingency ATCSMAC plan. Notification at least six months prior to the planned suspension of an existing ATCSMAC is required.

In the first instance the promulgation of a NOTAM should be the preferred method of notifying a temporary suspension of the current ATCSMAC in the UK AIP. This should suffice if the impact of the outage on the ATCSMAC is minimal e.g. the physical extents of the SMAA/s remain unchanged, but the minimum initial altitudes are raised.

If it is considered that a NOTAM will not be sufficient to impart the required level of detail and situational awareness e.g. multiple changes in SMAA boundaries, then it

will be necessary to issue an AIP Supplement for the duration of the suspension of the existing ATCSMAC

UK AIP Supplements containing contingency ATCSMACs plans must include:

- Nature of the outage;
- Proposed implementation and end dates;
- Contingency SMAA chart;
- Other information the Sponsor or Airspace Regulation deems relevant to the submission.

Chapter 2

Design and specification

Nominal standard dimensions

The dimensions of the SMAA should cover the airspace within which it is likely that controllers will be vectoring arriving flights.

For single instrument runway aerodromes, the nominal standard lateral shape is a racetrack area, 26NM long and 16NM wide, centred on the Aerodrome Reference Point (ARP). For multi instrument runway aerodromes, a circular SMAA of radius 15 NM, centred on the ARP, is considered appropriate. See Appendices A and B.

When operationally desirable, the nominal standard dimensions may be modified or adapted to provide optimum ATC vectoring profiles with regard to local terrain, traffic flows and airspace arrangements.

SMAAs may include sectors to provide relief from dominant obstacles that may be pertinent to only one runway circuit direction.

Design principles

SMAA

The basic principal is to draw circles of (3NM or 5NM radii dependent on Radar Approval) around all significant obstacles or terrain within an SMAA sector and apply the MOC. The Minimum Altitude will be: the dominant (highest) obstacle in sector + 300m (984ft) rounded up to the next (higher) 100ft interval. For the purposes of establishing the Minimum Altitude, obstacles within the PSB are also included.

Irrespective of the chosen dimensions of the SMAA/s, it is the Sponsor's responsibility to provide (via their contracted APD) WGS 84 Latitude and Longitude coordinates of the lateral limits. If a design is bespoke, the rationale behind the lateral limits will be required.

SMAA sub-sectors

Any additional SMAA sub sectors can be defined as radius arcs from the dominant obstacle (3NM or 5NM) however, in complex terrain situations, or where a number of fixed obstructions are adjacent to one another, it may be necessary to create a sub sector that links the boundaries of arcs drawn around the obstructions. This may result in a curved or irregular SMAA sub sector boundary and it may be more appropriate to create a larger/simplified sub sector depicted with straight lines. These sub sectors should be defined by WGS 84 Latitude and Longitudes.

Consideration also should be given to any detail that may confer operational advantages and which may further affect the shape, size and internal levels of the SMAA sectors such as:

- High or challenging terrain;
- Analysis of existing/future routes and airspace;
- The surveillance equipment in use and its performance;
- Local relevant procedures that might affect vectoring;
- Surveyed aerodrome data, terrain data and vertical obstructions within 30 NM of the unit;
- Any obstacles under development (e.g. tall building development or erection of radio masts, etc.);

FAVA

If it is necessary to descend aircraft below the minimum altitude specified for the SMAA Sector prior to the Final Approach Fix (FAF), then FAVAs will need to be specified for each applicable runway. The default dimensions of the FAVAs are shown at Appendices A and B. This default specification is suitable for most applications; however as with the SMAAs this may not be appropriate in all cases and bespoke dimensions can be applied.

Within the FAVA, a reduced clearance of 150m (492ft) above the dominant obstacle shall be applied and this figure will be rounded up to the nearest hundred feet. It should be noted that this is a minimum altitude to be allocated according to ICAO and the Sponsor is free to publish a different (higher) altitude depending the actual altitudes that will be allocated at the Aerodrome.

In order to simplify the design of a SMAA, FAVAs need not be shown if their respective minimum altitudes are the same as the SMAA it is situated within.

MSA

In order to validate the Minimum Sector Altitudes (MSAs) associated with any promulgated Instrument Approach Procedures (IAPs), a circle of radius 30NM (equates to IAC promulgated MSA of 25NM + 5NM buffer) should be drawn, centred on the appropriate Navaid or ARP. The area encompassed by this circle should be inspected for significant obstructions. If there are published IAPs based on NAV AIDs, which are off the airfield, the MSAs for these facilities should also be considered. The purpose of calculating all appropriate MSAs is to establish a single set of MSAs for all Instrument Flight Procedures (IFPs) relative to the aerodrome, in accordance with ICAO Document 8168 PANS OPS, Volume II, Part One Section 4, Chapter 8 Page I-4-8-3.

Once calculated the highest MSA for each specific quadrant is used to produce a single set of values. For example, if three MSAs are calculated for the North East quadrant as 2300 ft, 2200 ft and 2500 ft; then 2500 ft will be used on all relevant IFP charts.

Obstacle data

There are 3 main sources of obstacle data required for ATCSMAC design/review:

- CAP 232 Aerodrome Survey – This contains an annually updated list of significant obstacles in the vicinity of the airfield. This data is owned by the Aerodrome Licence Holder.
- Digital Vertical Obstruction File (DVOF) – This contains details of obstacles across the whole UK. The data to a minimum of 30NM from the Airport will be required. It is supplied routinely to all APDs by Defence Geographic Centre (DGC) Feltham.
- Terrain Data – Although a good starting point, the UK CAA Topographic VFR 1:250,000 charts are updated infrequently and further obstacle data sources should be utilised. These Data sources should be detailed in the submission. The UK Ordnance Survey provide (free of charge) various

mapping and terrain data and numerous data sets are available for purchase.

Other design considerations

Prohibited Areas, Restricted Areas (including HIRTAs and Gas Venting Sites) or Danger Areas within the SMAA may also affect its design, although are not considered 'hard objects' or obstacles.

It may not be practicable or desirable to present all ATCSMAC data to the users of the surveillance equipment. A balance must be struck between providing sufficient information for the service to be provided safely and effectively, whilst avoiding display clutter.

It remains the Sponsor's responsibility to assess any changes in the surveillance displays, in accordance with their safety management system, to ascertain the appropriate level of detail to provide a safe and effective surveillance service.

Specifications

Published ATCSMACs are available to view online in the relevant AD 2 section of the UK AIP. The UK specification for ATCSMACs conforms to the ICAO charting requirements (ICAO Annex 4, Chapter 21). For any amendment, the existing chart should form the basis of the submission. For any new design, the following standard format forms the basis of what should be submitted. This will assist the NATS AIS Publications Team who are ultimately responsible for producing the final Chart for AIP Publication.

In the header & footer each ATCSMAC contains the airport name and carries the relevant UK AIP AD 2 page reference, including date of publication. The AIRAC publication cycle reference is also shown, together with the date of origin for the aeronautical information. Brief details of the latest changes will also be shown.

The ATCSMAC is then split into the following areas:

Chart

A scaled chart depicting the SMAA sector/s and FAVAs (where appropriate) with a solid heavy line. No fixed scale is required for the chart as long as the SMAA sectors comfortably fit within the chart area (17cm Width). The minimum altitudes will be depicted along the inside boundary of the SMAAs/FAVAs.

The MSAs outside the SMAA will be detailed along the outside boundary of the SMAA with each MSA sector shown as a fine solid line, with cardinal points designated as a QDM, on the outside of the SMAA boundary.

The FAT for each runway will be shown as a fine broken line with the appropriate runway designator.

Radio navigation facilities shall be shown by standard ICAO symbols and bearings designated by medium pecked lines, where these will enable a pilot to check his position in the event of loss of communications.

Significant obstructions and dominant spot heights shall be shown by standard ICAO symbols.

Geographical features, such as coastlines or rivers, adjacent aerodromes and urban conurbations will be shown if considered operationally significant. Urban areas, where shown, shall be lightly shaded.

Prohibited, Restricted and Danger Areas will be shown and annotated with their respective reference designator and operating level(s).

Adjacent controlled airspace boundaries, at or below 5000 ft/FL55, will be shown.

Relevant ATS Communication Frequencies are shown.

Delineation of appropriate Lat and Long coordinates around the periphery and a 10 nm scale bar for guidance.

Other information may be depicted, if considered operationally significant.

Minimum initial altitude

Lateral dimensions of the SMAA sector/s, shown as WGS 84 Lat/Long coordinates formatted in Deg/Min/Sec and prefixed with the respective Minimum Initial Altitudes.

Outside the SMAA

Summary of the responsibilities of ATC for terrain clearance when vectoring an aircraft outside the SMAA sector/s;

Loss of communication procedures

Loss of communications for each runway will be shown for the two phases of the procedure:

1. Initial approach;
2. Intermediate (Base Leg or 40°Leg) and final approach.

Loss of communications and missed approach procedures are an important textual part of the ATCSMAC. These will relate to and conform with any procedures associated with published IAPs for the aerodrome.

General information

The General Information box contains standard textual information appropriate to all ATCSMACs and these are numbered for ease of reference. In some circumstances, such as in the case of a bespoke ATCSMAC, the general information box may contain modified or additional entries if appropriate, but will be based on the following:

- Levels Shown are based on QNH.
- Only significant obstacles and dominant spot heights are shown.
- The minimum levels shown within the ATC Surveillance Minimum Altitude Area are in conformance with the Standard European Rules of the Air - SERA.5015.
- MSAs are based on obstacles and spot heights within 25 NM (+5NM buffer) of the relevant Navaid.
- Controlled airspace with a base in excess of 5000 ft or FL55, as appropriate, is not shown.

- The chart may only be used for cross-checking of altitudes when in receipt of an ATC Surveillance service.
- (If Applicable) When vectoring an aircraft within the Final Approach Vectoring Area descent clearance below the SMAA to the FAVA altitude may only be issued if the aircraft is either established on the final approach track or on an intercept of 40° or less, and in the case of instrument approaches other than SRA is cleared to intercept the final approach track.

Chapter 3

Promulgation and approval

The (re)publication of an ATCSMAC will be triggered by 1 of 4 scenarios, each of which is further described.

1. A new ATCSMAC request
2. A periodic review
3. An operational amendment
4. A non-operational amendment

New ATCSMAC chart request

See specifications for details of what is required in terms of chart content. It should include as a minimum: accurate latitude & longitude marks, significant and dominant obstacles, clearly defined SMAA/FAVA boundaries and associated annotations. Runway centrelines should also be shown. It is good practice to view other published ATCSMACs in the UK AIP before creating a new chart.

The new drawing and any accompanying documents are to be supplied to Airspace Regulation who will, as part of the approval process, check the SMAAs and FAVAs to ensure the minimum altitudes are appropriate to the obstacle environment. All other detail on the chart is the responsibility of the Sponsor.

The dominant obstacle which determines the minimum altitude of each sector should be clearly identified, including reference name/number, latitude and longitude, Height AMSL, Height AGL, a description of what it is and whether lit or unlit.

The submission should also be accompanied by a completed copy of the ATCSMAC Review Sheet (see Appendix D).

Once the submission has been approved by the CAA, it is the responsibility of the Sponsor to submit the AIP change request relating to the ATCSMAC.

The NATS AIS Publications team will forward a proof copy of the ATCSMAC to the Sponsor for final acceptance before the publication date.

Note: A new ATCSMAC is subject to CAA approval charges and shall be forwarded to Airspace Regulation for approval before any AIP Change request is submitted.

Periodic review at an interval not exceeding 5 years

To ensure the safe operational application of their SMAA, it is the responsibility of the Sponsor to complete a periodic review at an interval of not more than 5 years to cover every element on the ATCSMAC. This review shall be aligned with the review of other Instrument Flight Procedures relative to the aerodrome. This review should re-source and re-apply all obstacle data and check all the areas that are listed in Appendix D.

Appendix D shall accompany all reviews to assist the identification of any necessary changes.

If, during a periodic review it is decided that there are no changes to the ATCSMAC, a completed Appendix D certifying that a review has been conducted is still required.

The Appendix D shall be dated accordingly and submitted by email by the Sponsor. Reviews shall be sent to airspace@caa.co.uk.

Note: A periodic ATCSMAC review is subject to CAA approval charges and shall be forwarded to Airspace Regulation for approval before any AIP Change request is submitted.

Operational amendment

The Sponsor shall, if appropriate, independently re-issue the ATCSMAC as soon as possible if the changing obstacle environment or Aerodrome operational requirement dictates an amendment to the SMAAs or FAVAs, either laterally or vertically. See also Contingency in Chapter 1.

A copy of the existing ATCSMAC should form the basis of a working drawing, unless a complete re-design is being attempted. All new obstacles, changes to existing obstacles and textual detail should be identified and clearly marked.

Changes in any of the following items may require a change to the lateral/vertical SMAA/FAVA dimensions:

- Any (re)assessment of the obstacle environment or part thereof;
- Runway extensions;
- QDMs of runways;
- Designations and locations of navigation aids or reporting points;
- Airspace structures including Danger/ Restricted/ Prohibited Areas;
- Instrument Approach and Missed Approach Procedures where vectoring is required;
- Loss of communication procedures;
- Changes to lateral surveillance RADAR separation;
- Introduction or withdrawal of surveillance RADAR approach procedures.

This list is not exhaustive and is intended for guidance only. Any item that will impact on the accuracy of the ATCSMAC should be considered.

If the change dictating the operational amendment is considered in isolation, then this will not constitute a periodic review. If however in the course of an operational amendment the criteria listed in Appendix D is checked, we can consider this a periodic review. The CAA would therefore recommend that it is beneficial to progress any operational amendment to a periodic review.

It is particularly important that any changes to existing obstacles, or the establishment of new obstacles, are clearly defined, including reference name/number, latitude and longitude, Height AMSL, Height AGL, a description of what it is and whether lit or unlit, with supporting documentation attached.

Note: An operational amendment to an ATCSMAC is subject to CAA approval charges and shall be forwarded to Airspace Regulation for approval before any AIP Change request is submitted.

Non-operational amendment

An ATCSMAC should be independently re-issued by the Sponsor at the next available AIRAC date if the background detail on the chart is amended.

A copy of the existing ATCSMAC should form the basis of any working drawing supplied. Examples of background detail:

- Minor amendment of individual obstacles where it can be clearly proven that there is no impact on the SMAAs or FAVAs;
- Withdrawal or relocation of SMAA sector reference Navaid;
- Changes to Airport characteristics, e.g. removal of instrument runways;
- Airspace captured within the chart window;
- Airfields captured within the chart window.

This list is not exhaustive and is intended for guidance only. Any item that will impact accuracy or content of the ATCSMAC should be considered.

While submitting a non-operational change it is good practice to check all the non-operational criteria listed in section 3a/3b of Appendix D (review check list) to ensure no other details require amendment.

Note: A non-operational Amendment to an ATCSMAC does not require approval from Airspace Regulation and an AIP change request form can be directly submitted.

Summary

The Sponsor is responsible for ensuring both accurate information and timely amendment in relation to their ATCSMAC as published in the UK AIP.

The chart should be periodically reviewed in conjunction with other IFPs.

Any new chart request, periodic review or operational amendment shall be performed by an APD.

Before submitting any changes via the UK AIP change request form, the Airspace Regulation section of UK CAA will need to approve any new chart requests, periodic reviews or operational amendments. This will attract a charge as per the IFP scheme

of charges and payment should be submitted (as per other IFP approval requests) using DAP 1917.

ATCSMACs that require non-operational amendment do not need to be performed by an APD, do not require approval from the CAA and do not attract a charge from the CAA.

Where CAA approval is required, as a minimum, the following shall be sent to airspace@caa.co.uk:

- Drawing with SMAA/FAVA accurately plotted and any new or amended Lat/Longs supplied;
- Current obstacles and high terrain plotted with source data referenced;
- Dominant obstacles for each SMAA/FAVA clearly identified;
- Minimum Altitudes for each SMAA/FAVA calculated.

After the UK AIP Change request has been submitted, the NATS AIS Publication Team will forward the final ATCSMAC draft to the Sponsor (Cc to Airspace Regulation) for acceptance.

If Airspace Regulation are made aware of errors on a particular ATCSMAC they will inform the Sponsor that the chart will need urgent review. If the error is considered to be of a safety critical nature, a NOTAM will be required to suspend the ATCSMAC with immediate effect until the required changes are promulgated by the airfield.

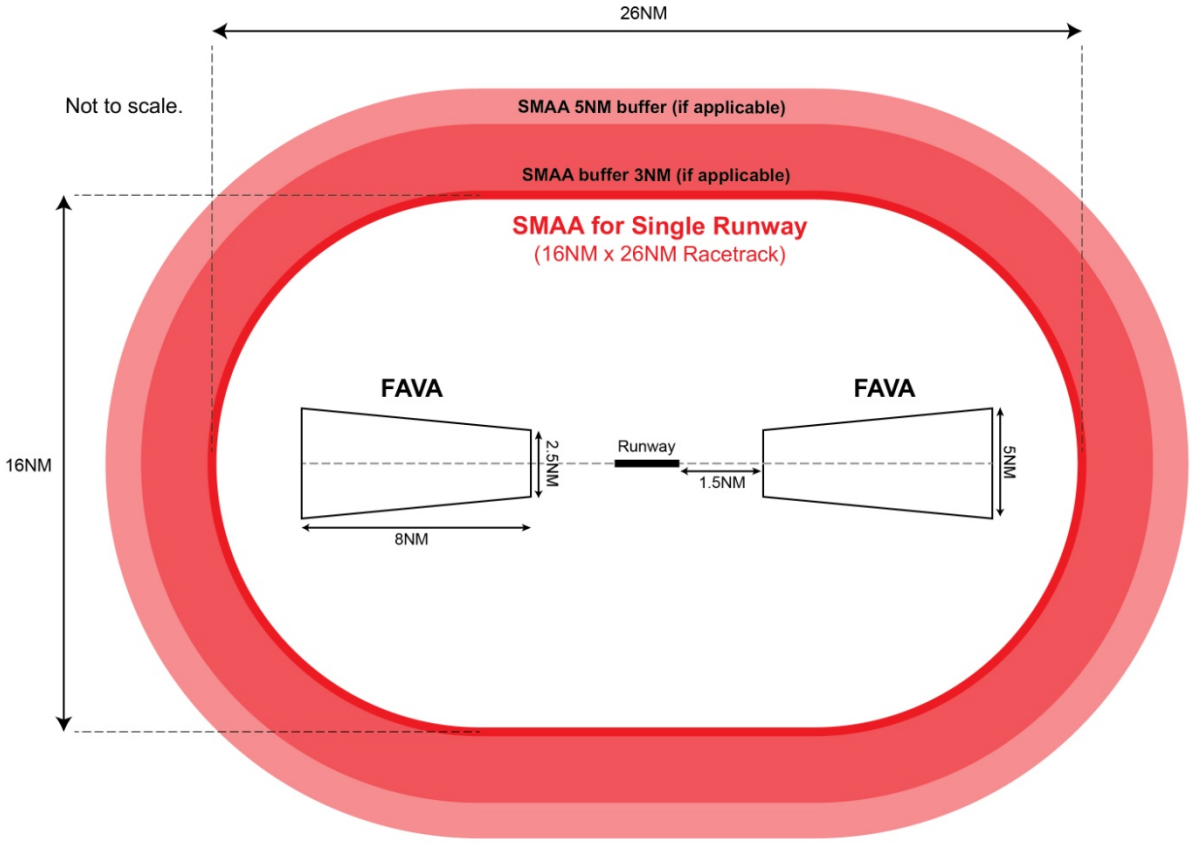
From January 2019 any amendments submitted by a Data Originator or Air Navigation Service Provider for onward promulgation in the Aeronautical Information Publication will be subject to the Aeronautical Data Quality Requirements. See Commission Regulation (EU) No 73/2010 (updated by 1029/2014) and CAP 1054: Aeronautical Information Management guidance material for further information.

See Appendix E for ATCSMAC promulgation workflow diagram.

Appendix A

Single runway dimensions

Single Runway Example
Standard Design for Final Approach Vectoring Areas (FAVAs)
& Surveillance Minimum Altitude Areas (SMAAs)

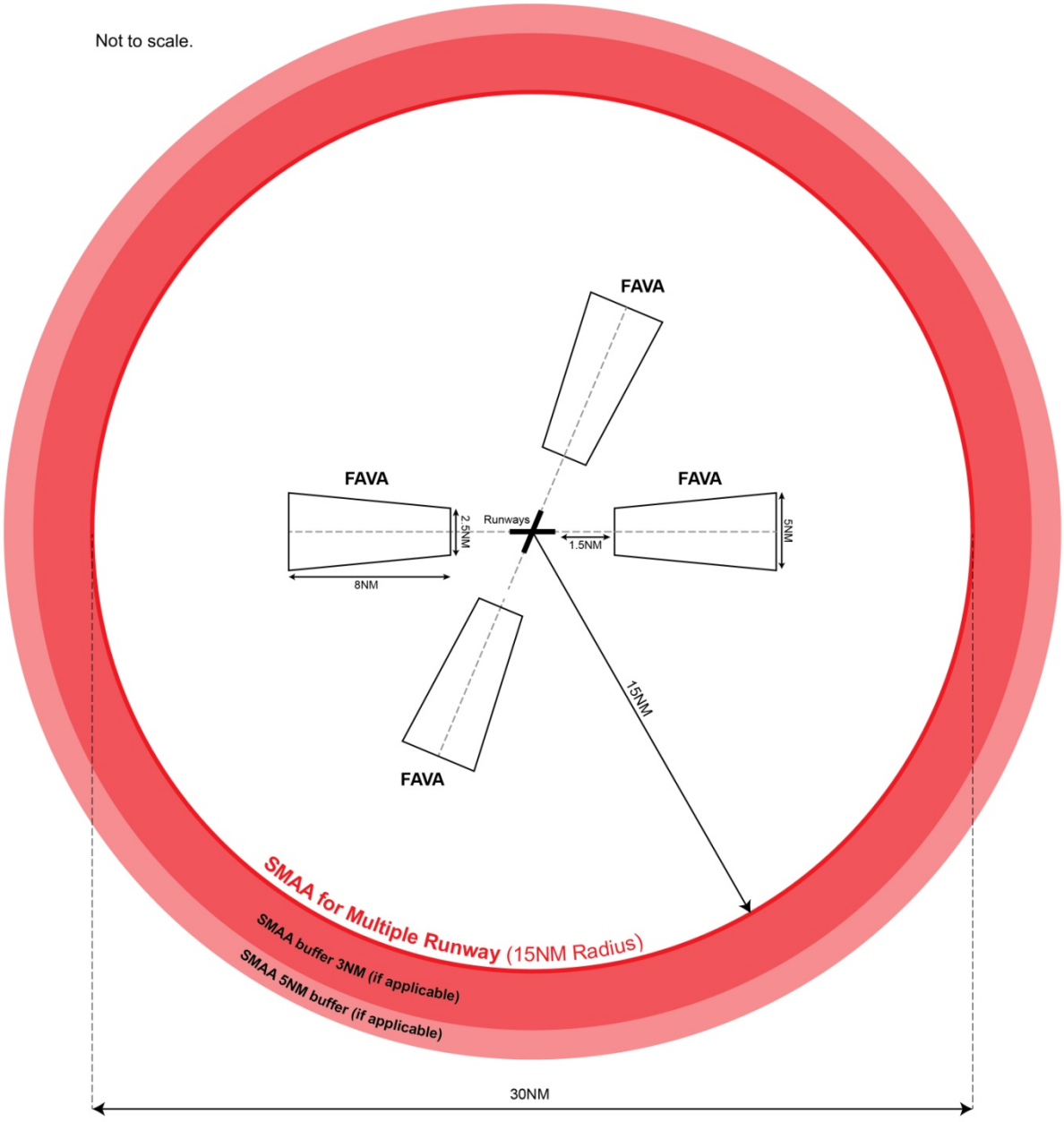


Lateral limits of the SMAA may be altered and/or sectorised to take account of obstacles and local operational procedures.

Appendix B

Multiple runway dimensions

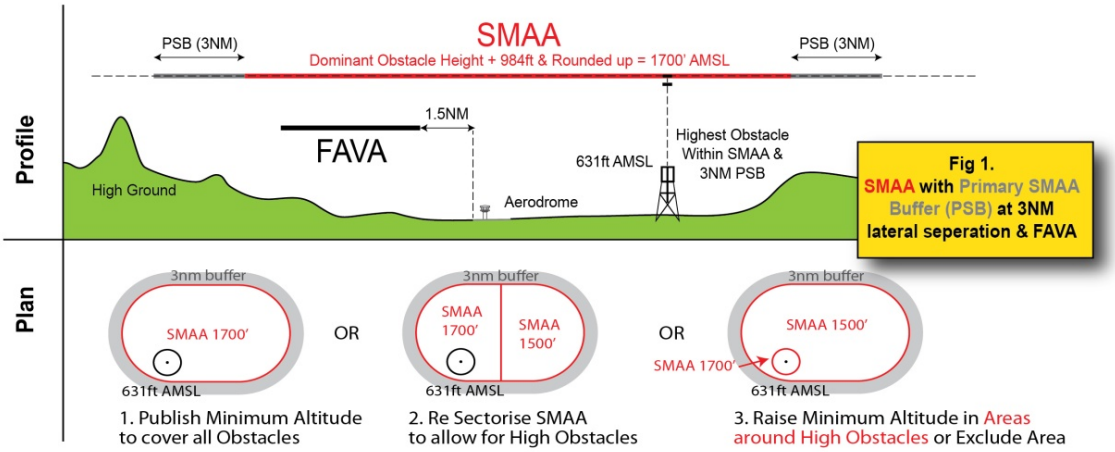
Mulitple Runway Example
Standard Design for Final Approach Vectoring Areas (FAVAs)
& Surveillance Minimum Altitude Areas (SMAAs)

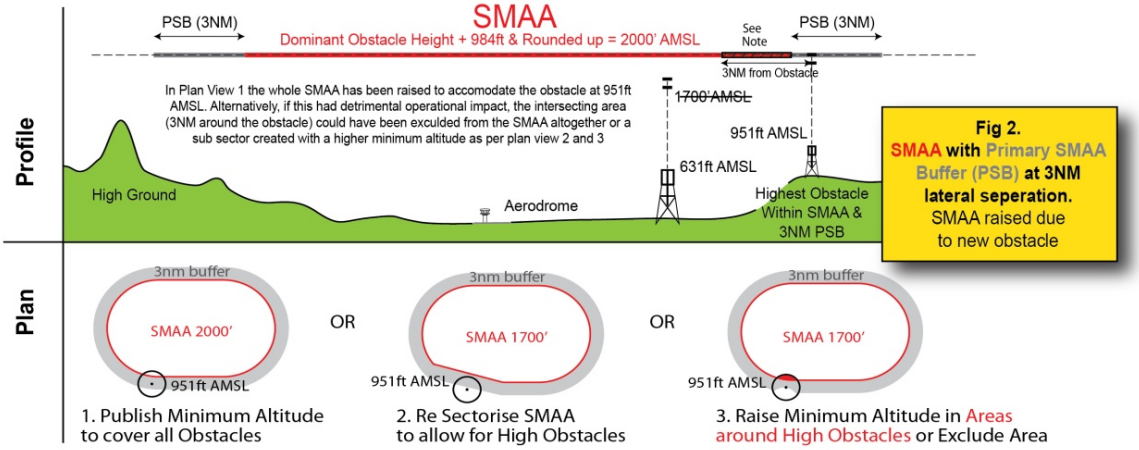


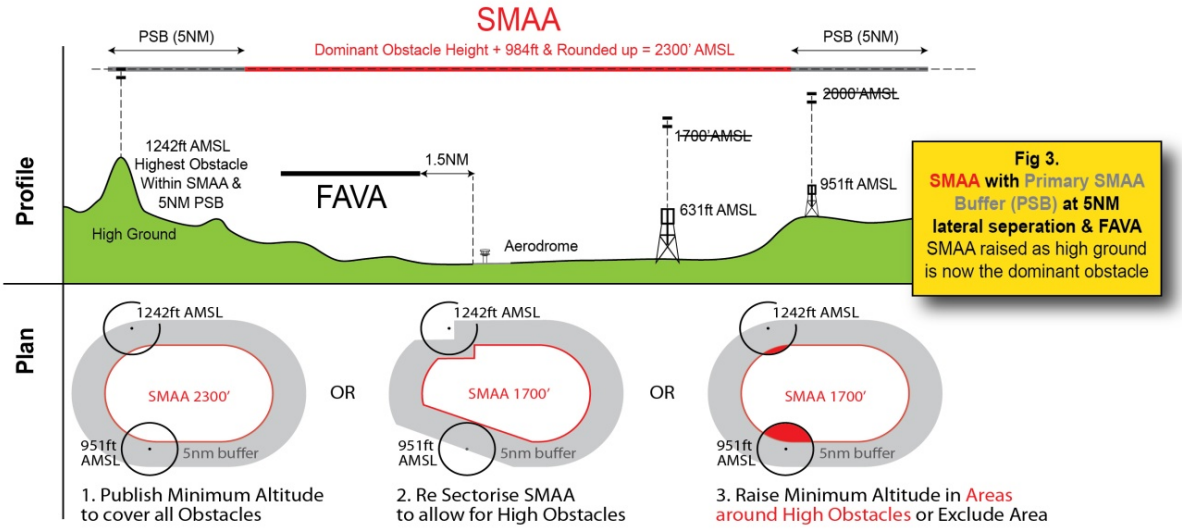
Lateral limits of the SMAA may be altered and/or sectorised to take account of obstacles and local operational procedures.

Appendix C

Terrain clearance and lateral sectorisation







Appendix D

ATCSMAC review / amendment sheet

Appendix D available from publication page,

www.caa.co.uk/CAP777

Appendix E

ATCSMAC promulgation workflow