ATM OPERATIONS & STRATEGY DIRECTORATE/ SAFETY REGULATORY DIRECTORATE

Concept of Operations (CONOPS) for Inside and Outside of Controlled Airspace

Introduction a Harmonised Transition Altitude in the Shannon Flight Information Region in line with the UK/Ireland FAB

This document contains information on the application of a Common Transition Altitude for the Shannon FIR in line with its application in the London and Scottish FIRs

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1. Introduction

1.1. A harmonised Transition Altitude (TA) of 18,000ft is proposed with the intention of enhancing efficiency, both inside and outside controlled airspace, through standardisation of airspace and altimeter setting procedures. This will provide the foundation for future safety, environmental and economic benefits that will be realised through improvements to the vertical profiles of aircraft arrivals and departures in the Shannon FIR. It also serves as a platform for future airspace and operating concepts through programmes such as Single European Sky (SES), SES Air Traffic Management Research (SESAR), (Cross Border) Free Route Airspace (FRA) and UK/Ireland Functional Airspace Block (FAB)

1.2. IN-2014/03 articulates the UK/Ireland FAB position on a higher TA and also the European position at that time. Since the launch of the first UK consultation, as a pre-cursor to the introduction of a harmonised TA in the UK/Ireland FAB, the European Aviation Safety Agency (EASA) has conducted an initial consultation on a harmonised TA in line with the European Commission Rulemaking Procedure. The following regulatory options were identified and considered:

- ✓ Option 1 – Do nothing (i.e. no regulatory intervention)
- ✓ Option 2 – An Implementing Rule (IR) to implement a harmonised European TA at 18,000ft.
- ✓ Option 3 – An IR prescribing common criteria for the determination of the TA at or above 10,000ft.

1.3. EASA set up a Harmonised European Transition Altitude (HETA) Rulemaking Group to determine the European position. The HETA Group determined there should be no regulatory intervention, although EASA should issue guidance to States wishing to change their TAs in the future.

1.4. A decision was made by the UK Future Airspace Strategy Deployment Steering Group in December 2013 to proceed to a second State TA Consultation with a Concept of Operations (CONOPs) developed to support a Transition Level of 18,000ft for implementation in Winter 2017/Spring 2018, earliest.

1.5. The Irish Aviation Authority (IAA (ANSP & SRD)), in alignment with its UK FAB Partner, has developed this CONOPS which mirrors the UK CONOPs in content, timescales, project implementation and safety assurance activities and is in line with a Winter 2017/Spring 2018 (earliest) implementation date.

2. Governance

2.1. A joint CAA, NATS and MOD TA Project Team (TAPT) was established and now includes the IAA (ANSP & SRD)(Regulatory & ANSP), working in partnership to develop and implement a common TA of 18,000ft across the London, Scottish and Shannon FIRs.

2.2. Safety Assurance Activity will continue for the IAA (ANSP & SRD) project in line with the IAA (ANSP & SRD) Safety Management System (SMS) and through the IAA (ANSP & SRD) Regulatory processes.

2.3. The IAA (ANSP & SRD) is also represented at the UK-Ireland-Norway TA Oversight Group (UINTAOG) that reports to the UK/Ireland FAB Supervisory Committee.

3. Notification

3.1 The (IAA (ANSP & SRD)) CONOPs describes the high-level characteristics for the proposed harmonised raised TA in the Shannon FIR and should be considered as a baseline for the evaluation of procedures to be used.

4. Definition of Transition Altitude

4.1. ICAO definition (Doc 8168 Vol I, Part III, Section 1- Chapter 1): Transition Altitude (TA) - the altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes. The current UK/Ireland and European interpretation, in operational use in most countries, is that the TA is defined in whole thousands of feet (e.g. 6,000ft and below in Irish Airspace and the vertical datum is based on QNH). Above the stated value, Standard Pressure Setting is used.

5. Altimeter Setting Regions

5.1. An element of the TA project is the replacement of the existing Pressure Setting Regions, with new Altimeter Setting Regions (ASRs). The concept of ASRs has been developed to define regions where, below 18,000ft, a single QNH value will be defined within the ATM system and should be used as the altimeter setting for en-route flight. The principles used in ASR design were:

5.1.1. Minimum Number of ASRs. The areas should be as large as possible in order to be operationally viable, yet sufficiently small to ensure that the pressure difference within, and between ASRs is as low as practicable.

This is for two reasons:

5.1.1.1. Firstly the magnitude of pressure differences between two locations is a function of distance i.e. the further apart two locations are, the larger the surface pressure difference is likely to be.

5.1.1.2. The second reason is that the frequency of pressure differences between two locations is a function of distance, i.e. the further apart the two locations are, the greater the likelihood that there will be a difference in pressure.

5.1.2. The UK Met Office undertook a number of studies to assess these two issues, so the information could be used to establish how large the areas should be before the intra-regional and inter-regional differences became significant. These studies indicated that pressure variances are lower in the south than in the north of the UK, and tended to vary less from east to west than north to south. The TAPT decided that ASR boundaries should be designed to be 80-100 nm from the Nominated Altimeter Setting Aerodromes or Stations (NASAS) as a guiding principle.

5.1.2.1 MET Eireann has completed a similar assessment for the IAA (ANSP & SRD) Consultation process regarding the ASRs within the Shannon FIR. This report is provided separately for CONOPS Consultation.

5.1.3. The ASRs decided upon for the Shannon FIR, while not fully in compliance with the principle in 5.1.2, have been constructed based on expected traffic below 18,000 feet in these ASRs and the proximity of such traffic to the source of the ASR QNH data.

Specific Procedures for the Shannon FIR/Shanwick FIR interface for aircraft below 18,00feet will be developed as part of operational implementation.

5.1.4. It is also noted that the distance between stations should ideally be kept to a maximum of 100nm (including cross border) in order that large differences of pressure within an individual ASR are not routinely of significance.

5.1.5. The overarching requirement is that variation within each ASR, using historical data shall not be greater than 15hPa based on a 98% probability. This design criterion will allow suitable calculations to be made that ensure terrain separation and overflight of airspace reservations.

5.1.6 Common Boundaries. The areas would utilise common vertical and lateral boundaries, irrespective of the classification of airspace, thus avoiding the situation where differing QNH values would exist within each ASR inside and outside CAS. The boundaries would coincide with existing airspace structures where possible.

5.2. Each ASR will have a NASAS, detailed at Annex B, from which the QNH will be derived. This value will be promulgated in the routine half-hourly ASR Bulletin. ANSPs are to disseminate ASR QNH values, relevant to their area of operation, to controllers for onward and timely dissemination to aircraft operating on that ASR datum. The selection criteria for each NASAS were:

✓ The identification of a major aviation hub, thereby minimising the number of altimeter setting changes within the specific ASR.

✓ The ability, where possible, to supply METARs on an H24 basis.

5.3. Ideally, to be as centrally located as possible within each ASR to reduce the inter-regional differences.

5.4. To avoid risk of confusion between pressure settings used for take-off and landing, and that used within the area, where practicable ASRs have been named independently from the NASAS from which the ASR QNH value is derived. For example, the QNH provided by the Dublin NASAS is proposed to be called the LENSTA ASR.

5.5. An ASR QNH bulletin, derived from the METAR process, will be issued by the Civil Aviation Communication Centre (CACC) on a half-hourly basis for promulgation by Aeronautical Fixed Telecommunication Network (AFTN). Shannon FIR ASR values will be included in the bulletin in line with the UK-Ireland FAB.

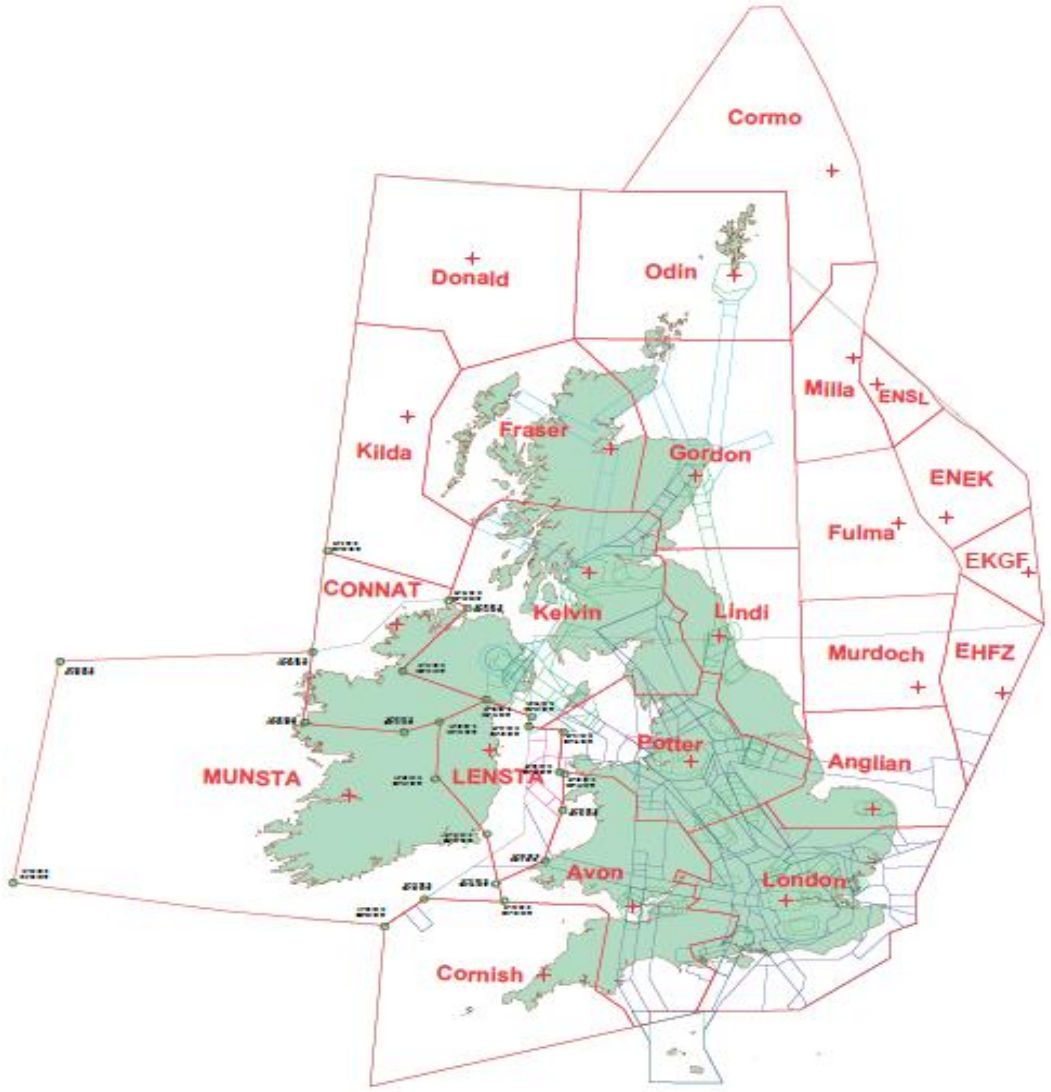
5.6. It is proposed that as part of the function of the ASR QNH Bulletin that should a METAR not be issued by a NASAS, or the METAR not contain a valid QNH, a back-up altimeter setting value will be issued by the UK/Ireland Met Office(s), based upon a predicted QNH for the same location. This proposal is currently under review by the IAA (ANSP& SRD).

5.7. Any interaction related to an ATC cleared altitude from one Air Traffic Service Unit (ATSU) with an adjacent ATSU, in particular for the purpose of ATC coordination, must clearly state the name of the ASR and the numerical value (hPa) of the pressure being used.

5.8. Whenever the Aerodrome QNH at an aerodrome which is also nominated as a NASAS changes by 1.0hPa outside of the METAR cycle, it is a requirement for the aerodrome to update the aerodrome QNH through a Local Special Report (SPECI) or equivalent; however, this will not change the ASR QNH. Thus, the relevant aerodrome QNH may be different to the ASR QNH. When the atmospheric pressure is forecast to change by ≥ 2hPa in the next METAR cycle, or there is a large pressure gradient, identified as ≥ 6hPa within an ASR, the UK/Ireland Met Office(s) will publish a warning alerting users to this fact.

5.9. The promulgated ASR QNH will be the altimeter setting value used to define the base of controlled airspace outside Class C airspace and TMAs; *however*, the upper and lower boundaries of CTRs/CTAs associated with an airfield will be based on the aerodrome QNH of the controlling authority. Details will be promulgated in the AIP.

Figure 1: Below is a pictorial view of the proposed (UK/Ireland FAB) ASRs



6. Relationship between Transition Altitude and lowest usable Flight Level

6.1. 18,000ft will always be available; FL190 will not be available for flight planning purposes throughout the Shannon FIR. This is because at any pressure below 1014hPa, FL190 does not provide standard separation against 18,000ft but may be available tactically as directed by the ANSP. Additionally, assessment and calculation of an updated transition layer will be undertaken for operational implementation of the CTA, to ensure that vertical separation is assured in situations where there is a significant difference between the ASR QNH value and standard pressure.

6.2. With the introduction of an 18,000ft TA, there is a requirement to amend the published bases of airspace and routes (where applicable) when they are currently defined as Flight Levels at or below FL180.

7. Pilot Operating Procedures

7.1. Pre-Flight Planning

7.1.1. Depending on when the planning process takes place, the actual ASR QNH expected during flight may not be known. Pilots should be aware of the potential variance between the (departure) aerodrome QNH and the ASR QNH and the associated risk of airspace infringement. Pilots operating close to the base of controlled airspace are recommended to set the ASR QNH and to select an appropriate cruising altitude to avoid inadvertent airspace infringement. Caution should also be exercised in the vicinity of ASR boundaries as the QNH of an adjacent ASR could vary from the QNH the aircraft is utilising.

Detailed procedures for the issuing of ASR/Aerodrome QNH values will be completed for operational implementation of the CTA.

7.1.2. The level at which a flight is to be conducted is to be specified in a flight plan as follows:

✓ Above the TA as a Flight Level.

✓ At or below the TA as an Altitude.

7.2. Departure

7.2.1 The relevant aerodrome pressure will be passed to pilots prior to departure. When remaining in the visual circuit CTA, aerodrome QNH shall be used as appropriate.

7.3. In Transit

7.3.1. Pilots in receipt of ATC Service should expect the air traffic control officer (ATCO) to provide and update the ASR QNH or aerodrome QNH as appropriate. When operating an aircraft below the TA, pilots will maintain altitude by reference to an altimeter as follows:

✓ The current reported ASR QNH along the route of flight; or

✓ The current reported QNH of a relevant aerodrome if at an altitude within their AOR***;***

7.3.2. Aerodrome QNH is considered valid for the purposes of terrain separation calculations within the Shannon FIR for the purposes of arriving and departing traffic within 40nm of the source datum.

7.3.3. Pilots intending to overfly airspace reservations should be cognisant of the potential impact of pressure variance within an ASR. To enable safe overflight of airspace reservations (Danger Areas, Restricted Areas and Prohibited Areas) where the upper vertical limit is defined as AMSL, *ATC will apply the safe crossing altitude, based on a system calculated altitude reflecting the ASR QNH value.*

7.3.4. When a MET pressure warning is issued (see para 5.7) of ≥ 6hPa variance across an ASR, an additional 300ft should be added making a total of 500ft to cater for worst case variance. Where this action conflicts with airspace reservations above, pilots must either request a crossing clearance or re-route around the airspace reservation.

7.4. Approach and Landing

7.4.1. The aerodrome QNH or QFE should be set prior to landing or as directed by ATC. In the event of a missed approach, pilots shall continue to use the aerodrome pressure, in lieu of the ASR QNH, if the intention is to make another approach to the same aerodrome.

8. General ATCO Operating Principles

8.1 Depending on the type of service requested, it is incumbent upon ATCOs to manage the pressure values used by aircraft in receipt of an ATS. This is to ensure that flights are operating on an appropriate pressure datum and that any conflicting aircraft on varying altimeter setting data remain separated or de-conflicted. Procedures will be developed and agreed between units to ensure that when an aircraft is transferred and a change in QNH is required, it does not result in a loss of separation. Where a control unit operates across multiple ASRs, full account must be taken of the potential pressure differences between each ASR to ensure retaining standard separation as necessary at all times.

8.1. When utilising an ASR QNH, ATS providers should add 200ft to any terrain separation calculation or to the depicted top altitude of any airspace reservation where the upper vertical limit is defined as AMSL. When met pressure warning is issued (see para 5.7) of ≥ 6hPa variance across an ASR, an additional 300ft should be added making a total of 500ft to cater for worst case variance. Where this action conflicts with other airspace reservations, ATS providers shall offer either a crossing clearance or a re-route around the airspace reservation.

8.2. When aircraft are climbing or descending, the display of either altitude or Flight Level on the surveillance display may change as they pass through the Transition Layer. In specific pressure situations where surveillance QNH conversion areas are used, the aircraft's MODE C readout could appear to 'jump' or 'drop'. This does occur now but may be more apparent and may take a longer time period to change due to slower climb rates at higher altitude. Similar events, depending on the datum selected on radar display at civilian and military units and pressure differentials, may occur as aircraft cross ASR and FIR boundaries.

8.3. Depending on radar data processing, if there is more than one processing datum for pressure, the user will experience 'jumps' in the displayed SSR pressure altitude at the processing boundary and 'creeps' of the displayed SSR pressure altitude as the aircraft adjusts to capture the altitude.

8.4. At and below the TA, unit surveillance systems may display SSR pressure altitude reports in relation to the corresponding ASR value or aerodrome QNH and not 1013.2hPa. Where aircraft below the TA operate on a pressure other than the QNH datum that is set within the Unit's surveillance system, the displayed altitude data may be at variance to the stated or cleared altitude. Unit procedures and training will be required to ensure that the display of SSR pressure altitude reporting information does not adversely affect the safe provision of ATS.

8.5. Where verbal, electronic or standing agreement co-ordination has been effected between ATCOs or ANSPs for the purpose of achieving required vertical separation or minima based on the same ASR QNH, the following shall apply:

✓ Co-ordination agreements shall include the name and the value of the ASR pressure.

✓ Following a change in the ASR QNH, provided that the change is no greater than 2hPa (in that ASR) and that the aircraft subject to coordination were vertically separated by an absolute 1000ft and remaining within the same ASR, controllers may instruct aircraft in receipt of a service to change to that new QNH without further coordination.

✓ Following a change in the ASR QNH of more than 2hPa, controllers shall not instruct aircraft to update to the new ASR QNH without further coordination. Specific procedures to describe this process will be completed for operational implementation of CTA.

9. RTF Phraseology

9.1. The CONOPS principles for RTF phraseology are that:

A QNH value shall be given:

- ✓ On clearance from a Flight Level to an Altitude.
- ✓ On changing ASR region at an altitude when the QNH value is different.
- ✓ Upon re-clearance of an aircraft to an altitude from an initial clearance to Flight Level.
- ✓ To an aircraft if not stated by the pilot on first contact.

9.2 Where flights are operating at an altitude or height, pilots are reminded to report the aircraft's vertical position and the altimeter setting on first contact.

9.3 The general principles for aircraft operating within the same ASR when a new METAR becomes available are:

(a) The sectors with responsibility for control of aircraft within a given ASR shall pass the new QNH value to traffic as soon as is operationally practicable.

(b) Approach sectors shall continue to operate in accordance with current procedures.

10. ATC Standard Operating Procedures - inside controlled airspace

10.1 Routine Procedures

10.1.1. Aerodromes will normally utilise the Aerodrome QNH after departure. However, changing the QNH of an aircraft flying a Standard Instrument Departure (SID) does not cancel the pilot's responsibility to follow the vertical profile of the SID based on the updated pressure. This applies whether the change is due to an Aerodrome QNH being updated or an ASR QNH being applied. It is the controller's responsibility to ensure that traffic remains separated and within the vertical protection of CAS. It is the responsibility of the releasing ATC unit to transition the aircraft to the ASR QNH prior to transferring the aircraft to the next ATC agency, unless in accordance with MATS Part 2 or tactical coordination and transfer agreements. ***There is no requirement for the controller to advise a pilot to report the QNH to the next agency.***

10.2. QNH Tolerance

10.2.1 It is recognised that, for certain specific procedure and aircraft interactions, there will be a need for a QNH tolerance to be defined and agreed that allows aircraft on differing QNH datum to be considered to be operating on the same altimeter setting and therefore separated by a nominal Vertical Separation Minima (VSM).

10.2.2 However, an absolute VSM is always aspired to, and only where it is identified that safety, workload, or other factors, necessitate the use of a QNH tolerance will such a procedure be sought as mitigation.

Note: The Safety Argument for the adoption of a nominal VSM will be addressed separately to this document through the IAA SMM Process in consultation with the IAA Safety Management Unit and IAA Safety Regulatory Directorate

10.2.3 The CONOPS is developed on the principle of the maximum tolerance being 4hPa between aircraft pairs but for service provision, this may be delivered through a procedure whereby an aerodrome QNH shall be within +/- 2hPa from the specified ASR QNH. The following scenarios are currently considered to be potential candidates for use of such a procedure, subject to demonstrable need:

✓ During METAR updates before all aircraft have adjusted onto the same updated QNH. This includes aircraft operating on a SID and where an aircraft has been assigned a cruising level that is 500ft above the base of CAS until such time as an update is received.

- ✓ Between aircraft following specified airport arrival and departure procedures.

- ✓ Between aircraft following specified airport arrival and departure procedures and other aircraft transiting CAS.

- ✓ At ASR or at international boundary interfaces with adjacent ANSPs.

10.2.4 QNH tolerance shall only be employed in airspace with surveillance provision with a density and controller workload such that any variation that exceeds the normal Mode C tolerance can be appropriately identified by the ATCO, with corrective action able to be provided in a timely manner. The QNH tolerance procedures shall also be developed to address the need to:

- ✓ Ensure safe and appropriate interactions with all ATC providers for control areas (CTA) that are contiguous with en-route controlled airspace.

- ✓ Enable the integration of military aircraft and service provision by Autonomous Radar Units without restriction on current flexibility.

(Note: This provision will require the agreement of these CONOPS with The Irish Aer Corps (IAC)

- ✓ Deliver the concept without the need for equipment based controller support tools that rely on Enhanced Mode S capability.

10.2.5 Where a QNH tolerance is employed, the controller shall instruct the aircraft to set the specified ASR QNH as soon as is reasonably possible whilst the aircraft remains within the same ASR. Specific procedures shall be defined by units to employ the QNH tolerance concept and must be supported by unit safety assurance and regulatory approval.

10.3 ASR Boundaries and Use of FL190

10.3.1 Unit procedures shall be defined to ensure that aircraft are provided with the ASR QNH for the region it is about to, or has just entered, taking account of sector and ASR boundaries. Unit procedures are to be promulgated to ensure that aircraft remain appropriately separated in the vicinity of the ASR boundary, either whilst remaining under the control of a sector operating across multiple ASRs, or during transfer to another sector with coincident ASR boundaries. If it is anticipated that an aircraft leaving CAS will be operating below the TA the ATCO should ensure that the aircraft has an appropriate pressure value.

10.3.2 Tactical use of FL190 could be appropriate provided the ASR pressure is 1014hPa or above, in accordance with local procedures or restrictions.

10.4 ATC Coordination with Adjacent ANSPs

10.4.1 All existing Memoranda of Understanding and Letters of Agreement will need to be reviewed and updated as necessary. In particular, those that currently utilise FL190 and FL200 will require reviewing by ANSPs.

10.4.2 Where bi-directional routes and areas of ATS delegation are involved there is likely to be a more significant impact (e.g. use of laterally spaced routes and level allocation etc.). These issues will be the subject of future bi-lateral discussions between the ATSUs. Proposed changes will need to accommodate subsequent TA changes by other States.

10.4.3 It should be noted that when the UK/Ireland FAB changes its TA to 18,000ft, and irrespective of whether neighbouring States change to the same TA at the same time, or in the future, there will be a need to mitigate the potentially significant QNH gradient between abutting ASR regions at the FIR boundary. Unit procedures are to be promulgated to ensure that aircraft remain appropriately separated in the vicinity of the FIR boundary.

11. ATC Standard Operating Procedures - outside controlled airspace

11.1. ASR QNH will be available for controllers for the provision of service within Class G airspace. However, units may decide to utilise a more suitable QNH such as the airfield QNH for the provision of service within the unit's area of responsibility.

11.2. In cases where a level has been agreed in coordination, it is the responsibility of the transferring unit to ensure that the aircraft has been instructed to set the agreed QNH prior to transferring the aircraft to the next agency. There is no requirement for the controller to advise a pilot to report the QNH to the next agency; however, the pilot should check-in with the next agency stating the QNH value set.

11.3. Flights operating below the TA should be passed an appropriate altimeter setting on first contact following transfer from another unit/sector unless it is the intention to clear them immediately to a Flight Level or procedures exist which negate the requirement.

11.4. Where a controlling unit operates in airspace across multiple ASRs, unit procedures shall ensure that aircraft remain appropriately de-conflicted at, and in the vicinity of the ASR boundary. When there is a pressure

difference between adjacent ASRs additional procedural measures may be required to ensure de-confliction minima is maintained where necessary.

12. Interface with the Irish Aer Corps ATC Service

12.1. Interface arrangements with the Irish Aer Corps for application of a common TA shall be addressed through the relevant LoA.

ANNEX A: Glossary

Absolute VSM (Vertical Separation Minima)

The separation of 2 aircraft by 1 000ft with both aircraft being operated on the same altimeter subscale setting, or, the separation of 2 aircraft by 1000ft, correcting for a variance in altimeter subscale settings using the operational assumption of 1 hPa equating to 30ft

Altimeter Setting Region (ASR) QNH

The altimeter setting to be used when operating in an ASR based upon the actual QNH derived from the Hour +2 minutes(e.g.00:02) and half-hour +2 minutes(e.g.00:32) METARs

METAR

A format for reporting weather information

Nominal VSM

Where aircraft are assigned cruising altitudes separated by 1000ft but where the aircraft are operating with a variance of up to 4hPa between their respective altimeter settings. In this way, less than 1000ft of air exists between the two aircraft and thus the separation is 'nominally' 1000ft, based on the assigned cruising altitude

NOMINATED ALTIMETER SETTING AERODROMES OR STATIONS (NASAS)

The aerodrome or station from which the ASR QNH will be derived and promulgated in the half-hourly METAR update

Predicted QNH

Where a NASAS is unable to provide an ASR QNH the UK Met Office will provide a calculated QNH value

Pressure Gradient

Refers to a stepped change in atmospheric pressure caused either by a weather front moving across an area, or by the difference in atmospheric pressure between a point at a distance from the pressure datum;

QFE

The barometric altimeter setting that will cause an altimeter to read zero when at the reference datum of a particular airfield (e.g. runway threshold). The altimeter will read height above the airfield datum

QNH

The atmospheric pressure at an aerodrome corrected to mean sea level (based on the ICAO International Standard Atmosphere conditions throughout the height difference)

Radar Approach

An approach, in which the final approach phase is executed, under the direction of a controller using radar

Transition Altitude

The altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes

Transition Level

The lowest flight level available for use above the transition altitude

1 hPa measurement:

As a general principle, 1 hPa will be considered to be equivalent to 30ft for the purposes of calculating ATC coordination and separation requirements. It does not refer to any value programmed into ATS or aircraft systems.

FAB:

Functional Airspace Block (UK/Ireland FAB)

RTF:

Radiotelephony

ANNEX B: ASR Region Nominated Altimeter Setting Aerodrome or Station (NASAS)

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