



Agenda Item 3: Specific Air Navigation Activities and Developments
3.5 Air Traffic Management (ATM)

PROPOSED REVISED LATERAL SEPARATION CRITERIA FOR USE IN THE OECS

(Presented by the OECS)

SUMMARY

This working paper presents a proposal by the Directorate to rationalize and regularize the Lateral Separation Criteria utilized in the OECS.

1. Introduction

1.1 As indicated in 1.1, 1.2 and 1.3 of the proposal, which is attached as an **Appendix** to this paper:

1.1.1 It has long been recognized that the current VOR minimum separation of 15° at 15nm only provides 3.75nm of separation between the intended tracks (radials) of the two aircraft, which is even less than radar separation. This has resulted in some ATS administrations making adjustments to their operating minima.

1.1.2 In this regard, the objective of this revision is, not only to rectify conflicts in the minds of controllers with respect to the contradiction between the separation minima in ICAO Doc 4444 and the protected-airspace requirement contained in Annex 11 Attach. A Sect. 3, but also to do so in a manner that is logical, has minimal deviation from the established format with which controllers are familiar, and in which there is an appropriate inter-relationship between the various minima. This philosophy is critical, as these separation minima are to be used in the heat of tactical airspace-management operations.

1.1.3 In pursuit of this objective, it has been decided to utilize the protected-airspace concept in accordance with ICAO criteria to determine the correct minima to be used in the OECS. Also, it is logical that if the protected-airspace concept is to be the determining factor for VOR separation minima, it should also be the determining factor on which to base the separation minima for NDB as well.

2. Discussion

2.1 The meeting is invited to take note of the additional efforts of this working paper to determine the separation criteria for RNAV/GPS and the reduced lateral separation distance minima, and to rationalize the separation procedures with respect to direction-of-flight.

2.2 The attention of the meeting is particularly drawn to Para. 1.9 of the Appendix, as follows:

2.2.1 It is recognized that any increases in separation minima from that which has previously been applied will cause concerns with respect to increases in general airspace-occupation/time-en-route, both for the controller and the operator, but these will be relatively minimal if the overall situation is looked at realistically, as the actual increase in off-track operations will be minimal when factored as a percentage of overall flight operations.

2.2.2 The overriding consideration should be that the airspace management requirements are now being regularized to enhance and ensure safety, and to remove the ambiguities and uncertainties that have existed for far too long.

2.3 The concepts contained therein are also presented with a view to generating discussion on ideas which may be of assistance to other administrations that may need to conduct a similar exercise.

3. Recommended action

3.1 The meeting is invited to consider the contents of the working paper and to provide comments and suggestions that may assist the Directorate in the finalization of the parameters of the Lateral Separation Minima to be used in the OECS.

APPENDIX

PROPOSED REVISED LATERAL SEPARATION CRITERIA FOR USE IN THE OECS

1.0. Preamble

1.1. It has long been recognized that the current VOR minimum separation of 15° at 15nm only provides 3.75nm of separation between the intended tracks (radials) of the two aircraft, which is even less than radar separation. This has resulted in some ATS administrations making adjustments to their operating minima.

1.2. In this regard, the objective of this revision is, not only to rectify conflicts in the minds of controllers with respect to the contradiction between the separation minima in ICAO Doc 4444 and the protected-airspace requirement contained in Annex 11 Attach. A Sect. 3, but also to do so in a manner that is logical, has minimal deviation from the established format with which controllers are familiar, and in which there is an appropriate inter-relationship between the various minima. This philosophy is critical, as these separation minima are to be used in the heat of tactical airspace-management operations.

1.3. In pursuit of this objective, it has been decided to utilize the protected-airspace concept in accordance with ICAO criteria to determine the correct minima to be used in the OECS. Also, it is logical that if the protected-airspace concept is to be the determining factor for VOR separation minima, it should also be the determining factor on which to base the separation minima for NDB as well.

1.4. In order to minimize the possibilities of confusion, assessment of the separation- minima criteria utilizing the protected-airspace concept should firstly be based on the current minimum distance and minimum separation angles with which all controllers are familiar, as follows:

- a) Determining the minimum angles that would achieve separation at the current minimum distance of 15nm from the facility, i.e. the minimum angles at which the relevant protected-airspaces do not overlap.
- b) Determining the minimum distances from the facility that the current minimum angles of 15° for VOR, and 30° for NDB would achieve separation, i.e. the closest distances at which the relevant protected-airspaces do not overlap.

1.5. In order to make this exercise as complete as possible, the separation minima for RNAV/GPS operations in the OECS will also be determined.

1.6. Additionally, Doc 4444 Chap. 5, 5.4.1.2.1.2.1 States: When aircraft are operating on tracks which are separated by considerably more than the foregoing minimum figures, States may reduce the distance at which lateral separation is achieved. In this regard, for example, where clearances for aircraft to maintain runway heading after take-off may serve to expedite departures in situations where inbound traffic may be less than 15nm away, the possibility of reducing the distance to no less than 10nm will be assessed.

1.7. For operational purposes, all separation minima will be rounded up to the nearest 5° and 5nm.

1.8. Uncertainties have been expressed, in numerous discussions, regarding interpretation of the applications of separation minima with respect to the relative directions of flight of the aircraft, which is caused by the wording and respective diagrams used in Doc. 4444. In this regard, EXCEPT when reduced separation is being applied to a minimum of 10nm from the facility (see 5.3.) when the aircraft's distance from the facility/separation-reference-point cannot be positively determined, these revised minima shall be applicable to all aircraft that are being separated, irrespective of whether one, or both, aircraft is/are inbound to, or outbound from, the facility/separation-reference-point.

1.9. It is recognized that any increases in separation minima from that which has previously been applied will cause concerns with respect to increases in general airspace-occupation/time-en-route, both for the controller and the operator, but these will be relatively minimal if the overall situation is looked at realistically, as the actual increase in off-track operations will be minimal when factored as a percentage of overall flight operations. The overriding consideration should be that the airspace management requirements are now being regularized to enhance and ensure safety, and to remove the ambiguities and uncertainties that have existed for far too long.

2.0. VOR

2.1. Utilizing the protected-airspace concept, the required protection published in Annex 11 is: 4nm up to 25nm, increasing to 6nm at 75nm from the VOR. (i.e. 5nm protection at 50nm), thus:

2.2. At 15nm from the VOR, 30° of separation is required to achieve 4nm protection.

2.3. At 15° of separation, the minimum distance required is approximately 33nm = 35nm from the VOR.

2.3. As a matter of interest, utilizing this methodology, the 20° of separation used by some authorities would achieve separation at a minimum of approximately 23nm = 25nm from the VOR.

2.4. While the overall intention is to ensure that these revisions will not complicate the controllers' airspace-management functions, they will thus have the option of choosing from the three separation minima rather than one, dependent upon the situation at the time. One option that might be considered for the thought-process, could describe the minima as being:

30° at 15nm, reducing to 20° at 25nm, reducing to the original 15 ° at 35nm.

3.0. NDB

3.1. The current ICAO separation minimum is 30° at 15nm.

3.2. In order to determine the protected airspace requirement for NDB separation, and in lieu of current documentation from ICAO, the Canadian standard was consulted, as published in the AIP. The standard is: 4.34nm out to the point where a 5° splay commencing at the NDB intercepts the 4.34nm protection-width at 49.66nm = 50nm, and continuing at a 5° splay thereafter.

a) for plotting/calculation purposes in the OECS the 4.34nm has been rounded up to 4.5nm;

- b) even at 4.5nm, between approximately 35nm and approximately 58nm from the facility, the protection required for NDB is actually less than that which is required for VOR - which is inconsistent with the relative accuracies of the two nav aids;
- c) thus, for OECS purposes, the 5° splay for NDB protection is determined to commence at 25nm from the NDB (where the VOR protection is 4nm), so as to ensure that the required protection for NDB will always exceed that of the VOR; and
- d) the protected airspace is therefore determined to be 4.5nm out to 25nm from the NDB, and increasing at a 5° splay thereafter.

3.3. Utilizing 3.2 (d) above, at 15nm from the NDB, 34° = 35° of separation is required to achieve 4.5nm protection.

3.4. Likewise, at 30° of separation, the minimum distance required is approximately 17nm = 20nm.

3.5. The minima required for NDB would thus be:

35° at 15nm, reducing to 30° at 20nm.

4.0 RNAV/GPS

4.1 Annex 11, Attachment B, Operational applications of RNAV routes based on RNP 4, précis, as follows:

- a) the use of RNAV equipment should be permitted for navigation along ATS routes defined by VOR;
- b) the navigational performance required of such RNAV equipment envisages a level of track-keeping accuracy for en-route purposes equal to or better than ± 6 nm for 99.5% of flight time. Navigational performance of this type is expected to be consistent with an accuracy of 4nm for 95% of flight time, which is similar to that currently achieved by aircraft operating within 25nm of a VOR/DME;
- c) the minimum protected airspace provided for RNAV ATS routes, with radar monitoring, should be 6nm for 99.5% of flight time, reducing incrementally to 4nm for 95% containment with radar monitoring; and
- d) before applying the values stemming from this concept, account should be taken of the possibility of achieving improvements in the over-all navigation performance of the aircraft.

4.2. The basic philosophy would be initially to justify utilizing the equivalent VOR/DME separation minima for RNAV/GPS. This, utilizing the protected-airspace criteria applicable to TSO C129, which is the minimum navigation performance requirement for RNAV/GPS operations in the E/CAR. At a later date, consideration might be given to justifying tighter separation minima.

4.3. ICAO Doc. 4444 RNAV Separation: Both aircraft to be established on tracks which diverge by at least 15°, and at a distance from the intersection at which the protected airspaces do not overlap.

4.4. The minimum navigation performance of aircraft/operators holding airworthiness approval for GPS as either stand-alone equipment approved by the DCA/OECS as complying with FAA TSO-C129, Class A, or equivalent; or multi-sensor equipment using GPS approved by the DCA/OECS as complying with FAA TSO-C129, Class B or C, or equivalent, does meet the protected-airspace criteria applicable to VOR/DME.

4.5. Thus, the separation applicable to GPS/RNAV operations in the OECS shall be the same as that which is applicable to VOR/DME.

5.0. Reduced Lateral Separation Distance Minima

5.1. As indicated in 1.6. above, where tracks are separated by considerably more than the original minima in Doc. 4444, consideration will only be given to a reduction of the minimum distance to 10nm from the facility.

5.2. Utilizing the protected airspace criteria, the minima that will be required to achieve separation at 10nm would be 45° for VOR, and 50° for NDB. It then remains for a decision to be made as to whether or not the angles of 45° and 50° are considered to be respectively “considerably more” than the original 15° for VOR and 30° for NDB, or whether a single minimum of, for instance, 60°, would be more appropriate (i.e. double the NDB original).

5.3. When the aircraft’s distance from the facility/separation-reference-point cannot be positively determined by DME/GPS/approved RNAV, the reduced separation shall only be applicable to aircraft that are outbound from the facility.

6.0. Conclusion

6.1. The overall proposal is thus to revise and standardize the lateral separation criteria and minima to be used in the OECS as, follows:

6.1.1. Except when reduced separation minima are being applied, the revised minima shall be applicable to aircraft that are established either inbound or outbound on radials/bearings/tracks relative to the navigation aid or method being employed.

- a) VOR/DME, RNAV/GPS: 30° at 15nm, 20° at 25nm, or 15 ° at 35nm; and
- b) NDB: 35° at 15nm, or 30° at 20nm.

6.1.2. Reduced Lateral Separation at 10nm:

- a) either, VOR: 45°, NDB: 50°, or VOR and NDB: 60°
- b) when the aircraft’s distance from the facility cannot be positively determined by DME/GPS/approved RNAV, reduced separation shall only be applicable to aircraft that are outbound from the facility.