Advisory Circular

AC91-3

Navigation Tolerance Areas — En-route Flight under IFR on Non-promulgated Routes

Initial Issue

01 July 2002

GENERAL

Civil Aviation Authority Advisory Circulars (AC) contain information about standards, practices and procedures that the Director has found to be an Acceptable Means of Compliance (AMC) with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices or procedures are found to be acceptable, they will be added to the appropriate Advisory Circular.

PURPOSE

This Advisory Circular provides methods, acceptable to the Director, for showing compliance with the navigation tolerance areas for establishing minimum IFR altitude requirements of Part 91 and explanatory material to assist in showing compliance.

RELATED CAR

This AC relates specifically to Civil Aviation Rule Part 91, Rule 417(b).

CHANGE NOTICE

There was no previous issue of this AC, consequently no change is in effect.

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Table of Contents

1 Applicability

The relevant rule 91.417 is reproduced as follows—

91.417 Minimum altitudes for IFR flights

(a) Except when necessary for take-off or landing, a pilot-in-command shall not operate an aircraft under IFR below—

(1) the applicable minimum altitudes prescribed in Part 95; or

(2) the applicable area minimum altitude prescribed under Part 95; or

(3) if no applicable minimum altitude is prescribed in that Part—

(i) in the case of operations over terrain with a height in excess of 10 000 feet, a height of 2000 feet above the highest obstacle within a horizontal radius of 5 nm within the navigation tolerance area; or

(ii) in the case of operations over terrain with a height in excess of 5000 feet, a height of 1500 feet above the highest obstacle within a horizontal radius of 5 nm within the navigation tolerance area; or

(iii) in any other case, a height of 1000 feet above the highest obstacle within a horizontal radius of 5 nm within the navigation tolerance area.

(b) A pilot in command shall establish the navigation tolerance area prescribed under paragraph (a)(3) in a manner that is acceptable to the Director.

This AC provides the pilot-in-command and the aeroplane operator with a method of establishing, as required under 417(b), the navigation tolerance area for the Lowest Safe Altitude (LSALT) applicable to IFR en-route operations, for a route or segment that is not prescribed under Part 95.

Where a radio navigation aid is used to establish a navigation aid tolerance area, in conformity with the following method, the LSALT within the tolerance area applies to operations by aircraft that are capable of navigation using that aid.

2 Definitions

Dead reckoning (DR) navigation means the estimating or determining of position by advancing an earlier known position by the application of direction, time and speed data:

Navigation tolerance area means an area encompassing-

(a) the degradation of navigation accuracy commensurate with the distance from a navigation aid; and

(b) the degradation of DR navigation accuracy outside the rated coverage of a navigation aid.

Lowest Safe Altitude (LSALT) means the lowest altitude within the en-route procedural design area that will provide a minimum clearance of—

(1) 2000 feet above the highest obstacle on an en-route segment over terrain with a height in excess of 10 000 feet; or

(2) 1500 feet above the highest obstacle on an en-route segment over terrain with a height in excess of 5000 feet; or

(3) 1000 feet above the highest obstacle on an en-route segment over terrain with a height of 5000 feet or less.

Area Minimum Altitude (AMA) is the altitude within a depicted latitude/longitude grid in PNG RNC. The altitude is shown as a bold number, or numbers, used to indicate altitude in thousands of feet. A smaller and equally bold number, underlined and adjacent to the larger number/s, denotes altitude in hundreds of feet. The depicted AMA will apply within the latitude/longitude grid enclosing it, plus a tolearance area of 17 NM all around the grid. Within this area the minimum clearance from terrain is the same as that shown above, in relation to LSALT.

3 Design of Navigation Tolerance Area

3.1 Routes defined by Radio Navigation Aids or DR

The tolerance area consists of a 5 NM area surrounding and including an expanding route navigation tolerance of—

(1) 12°, each side of the required track, from the navaid that provides the tracking guidance; or

(2) 15°, each side of the required track, when no track guidance is available and DR navigation is required to be used.

The maximum width of the route navigation tolerance area is 50 NM, on each side of the required track.

For a route or route segment using track guidance from a VOR, the maximum range to be used is 60NM. This recognises the potential that exists for loss of reliable navaid guidance if the aircraft is flown at the LSALT. No allowance can be made for “line of sight” range, for aircraft operations above the LSALT.

In circumstances where more than one azimuth navaid exists anywhere within the route segment and can be used to define a route, rated coverage shall be based on the shortest range navaid.

The effective areas for various circumstances are shown in Appendix A..

Note that there may be instances where an enroute or destination navaid has a rated coverage of less than 50 NM. If such a navaid is to be used, it is possible that the splay of the navigation tolerance area will never intersect with the area emanating from another enroute navaid. In any such case, the protection area to be applied shall assume that the navaid with reduced range does not exist – refer to examples 5, 6, 7 and 8 in Appendix A.

Where DR is the only means of navigation over en-route segment lengths longer than 200 NM, the navigation tolerance areas should be established in accordnace wiht the provisions of paragraph 3.3. For the purpose of this specification, a DR segment is defined as one where no navaid guidance is available at the departure point, enroute or destination.

3.2 Routes defined by Area Navigation Systems, including GPS

The tolerance area is the same as described in pargraph 3.1 above except thatthe maximum width of the route navigation tolerance area is—

(1) 30 NM, each side of the required track, for conventional RNAV systems, and

(2) 7NM, each side of the required track, for IFR-approved GPS.

3.3 Operations within a Latitude/Longitude Grid

The tolerance area consists of a 17 NM area surrounding the grid within which the operation is to be conducted. If enroute navigation involves a segment length exceeding 200 NM, all latitude/longitude grids within 50 NM either side of the nominal track, plus the 17 NM area surrounding each grid, shall be included in the assessment. Alternatively, use may be made of the AMA grids shown on PNG RNC1 and RNC2.

4 Charts

4.1 Chart Type and Scale

The following aeronautical topographical charts may be used :

(1) 1:1,000,000 scale (WAC or ONC series):

(2) 1:500,000 scale (TPC series):

(3) 1:250,000 scale (JOG series).

4.2 Terrain Assessment

Terrain found within the tolerance area is to be assessed as follows, to derive an assumed elevation value for the relevant obstacle :

(1) **Contours :** If the highest feature is a contour, add the contour interval, as specified on the chart, to the value of the highest contour within the tolerance area. There is no need to add the value applicable to chart vertical error to this result.

(2) **Spot Elevations** : If the highest feature is a spot height with a specific elevation, add the applicable value for chart vertical error.

(3) **Spot Within Contour** : If a spot elevation appears within the highest contour in the tolerance area, use the elevation applicable to the spot height and add the applicable value for chart vertical error.

(4) **Accuracy of Spot Feature Elevations** ; If the charted elevation of the controlling obstacle is noted as being questionable, a value of 200 FT shall be added to the charted elevation, unless the chart specifies a lesser value. If the chart indicates that vertical accuracy is not known, an on-site survey must be undertaken, to confirm the actual elevation.

(5) **Chart Vertical Error** : If there is no discernable value recorded on the chart, use a value of 100 feet.

(6) **Vegetation** : To account for the possible existance of vegetation on the chosen terrain feature, add 100 feet to allow for vegetation growth.

5 Minimum Elevation of Terrain

Where the assumed elevation of the relevant obstacle, as determined in paragraph 4.2 is less than 500 feet, the minimum elevation value to use is 500 feet.

6 Tolerance for Area QNH

The accuracy of an Area QNH value is to be regarded as ± 3 millibars of the actual QNH at any point in the area. Each millibar represents 30 feet, so the tolerance for Area QNH to be added to the assumed elevation determined in paragraph 4.2 is 90 feet. There is no need to add this value when the assumed elevation of the relevant obstacle is less than 500 feet.

7 Failure of Radio Navigation Aid

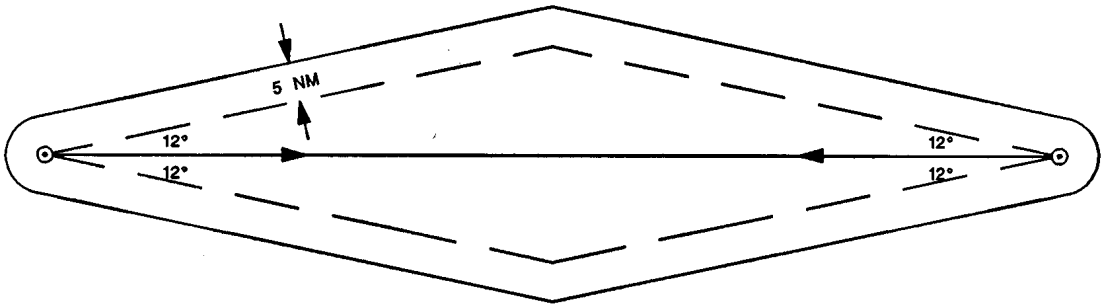
The navigation aid tolerance area for any route or segment must be adjusted, using the provisions of paragraph 3, in the event of failure of the relevant navigation aid, unless an alternative navaid is available for use at the same place.

8 Effective Areas

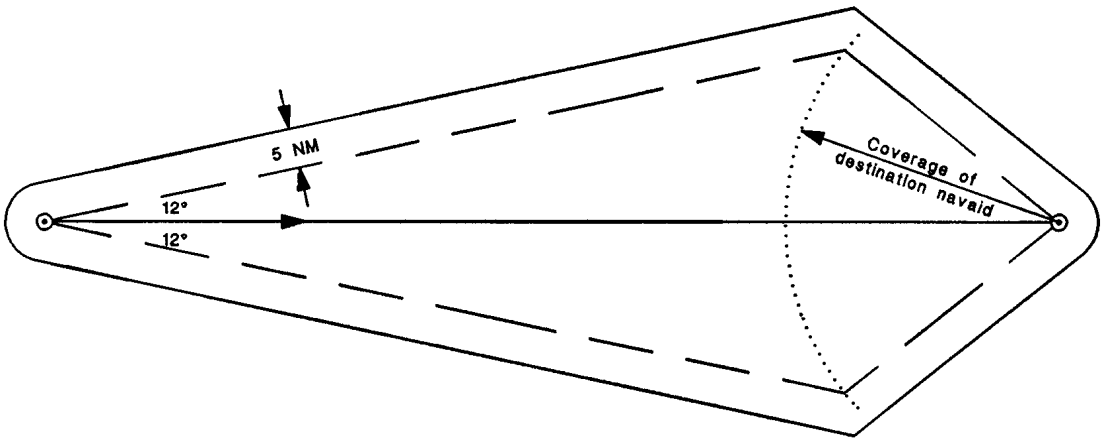
The diagrams in Appendix A are examples of the navigation tolerance areas for various circumstances of radio navigation aid guidance and provide additional information on the method used to establish the dimensions and shape of the area.

Appendix A — Examples of Navigation Tolerance Areas

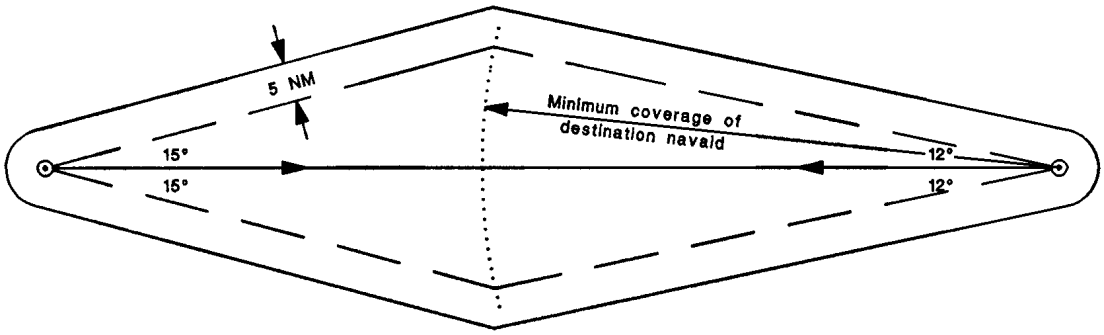
Example 1 : Route segment with navaids at each end and navaid coverage from each end for at least half the segment length.



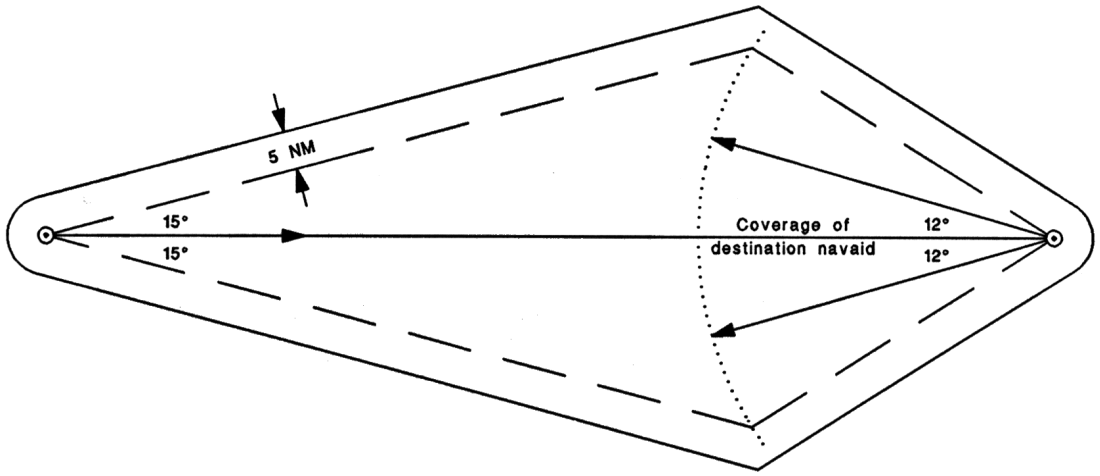
Example 2 : Route segment with navaids at each end, where coverage from the destination navaid is less than half the segment length, but navaid at departure end covers the distance up to at least the coverage of the destination navaid.



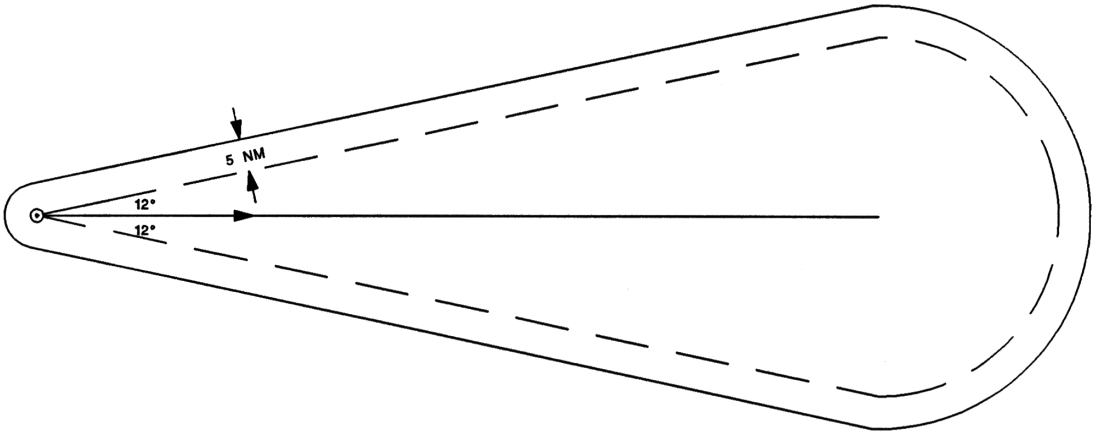
Example 3 : No navaid at departure end, but navaid at destination end such that the 12° lines from destination intersect 15° lines from departure end. Note that the route must commence at the depicted departure end, not some prior point.



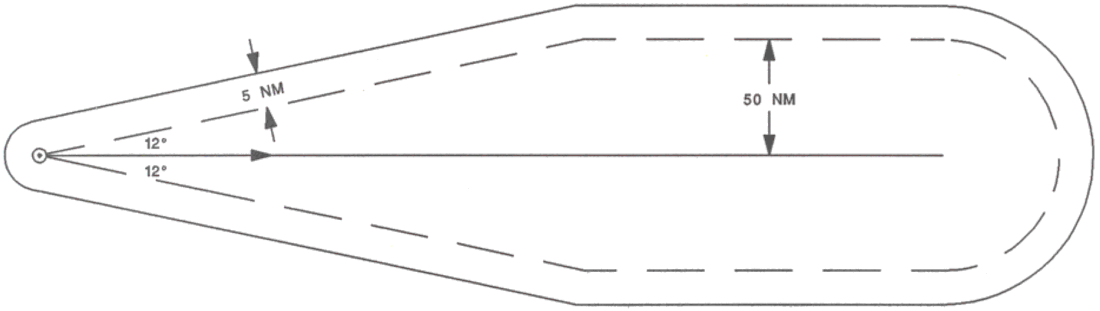
Example 4 : No navaid at departure aerodrome, but navaid at destination such that the 12° lines do not intersect 15° lines from departure end.



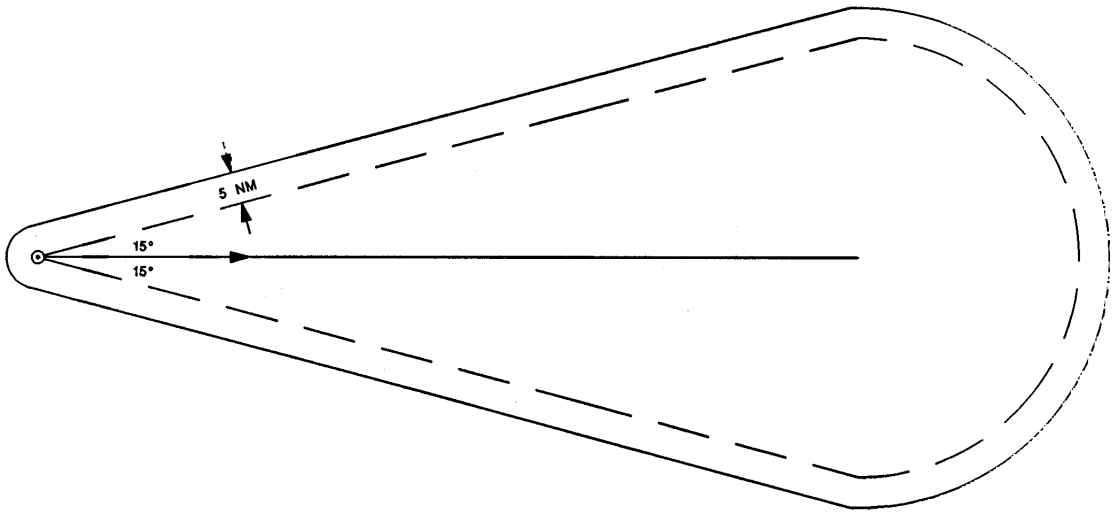
Example 5 : Navaid at departure end but not at destination, with segment distance not exceeding 235 NM (12° diverges 50 NM from track in 235 NM). This example assumes a minimum rated coverage of at least 235 NM.



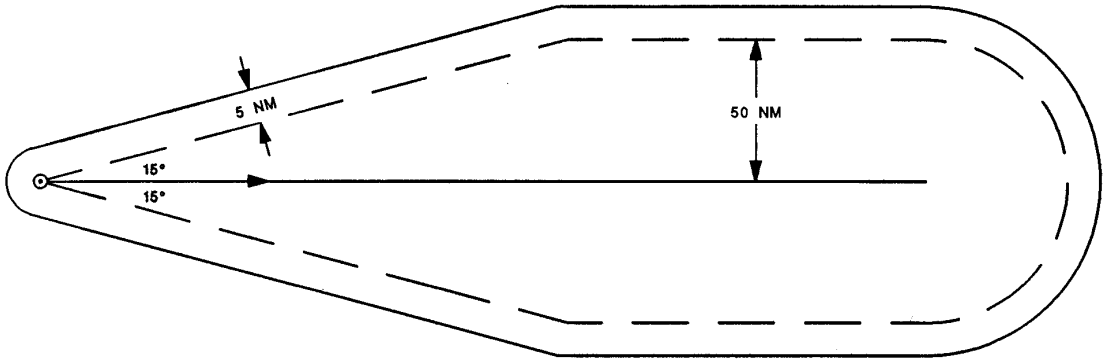
Example 6 : Navaid at departure end but not at destination, with segment distance exceeding 235 NM.



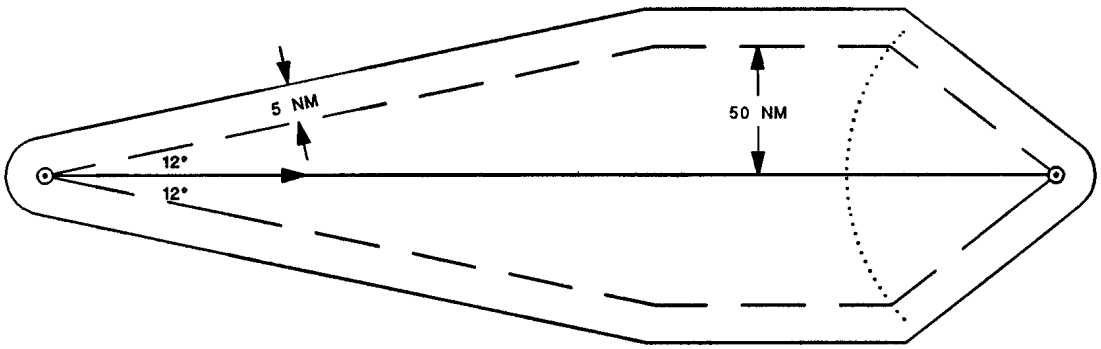
Example 7 : Route segment without navaids, with segment distance not exceeding 186 NM (15° diverges 50 NM from track in 186 NM).



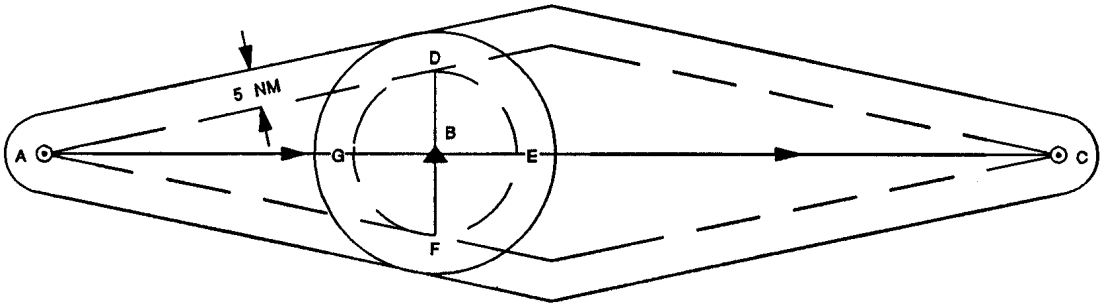
Example 8 : Route segment without navaids, with segment distance over 186 NM.



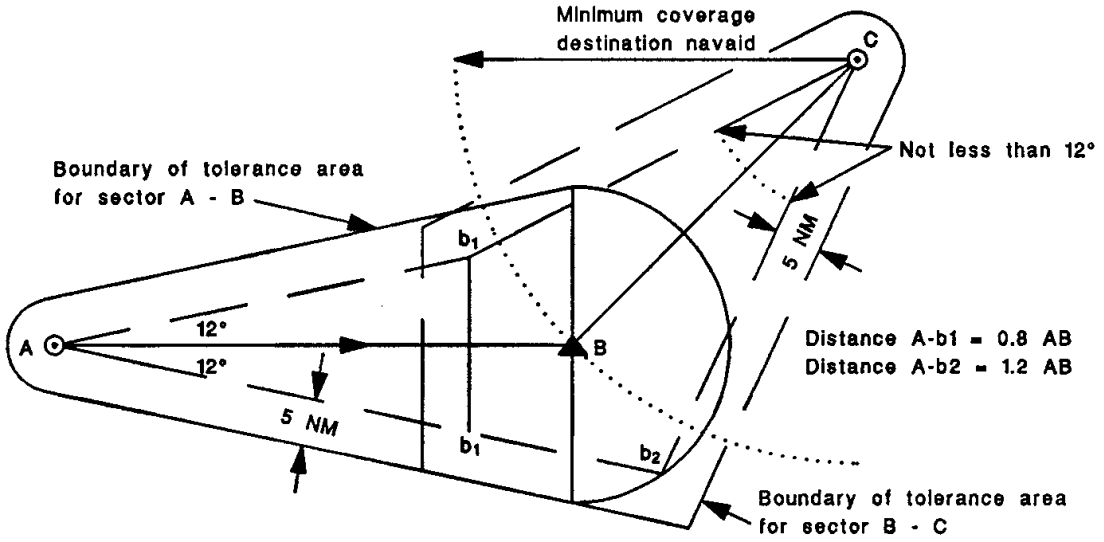
Example 9 : As for example 2, but 12° lines expand to maximum distance of 50 NM either side of track. In no case is the maximum width, inside the 5 NM buffer area greater than 50 NM either side of track.



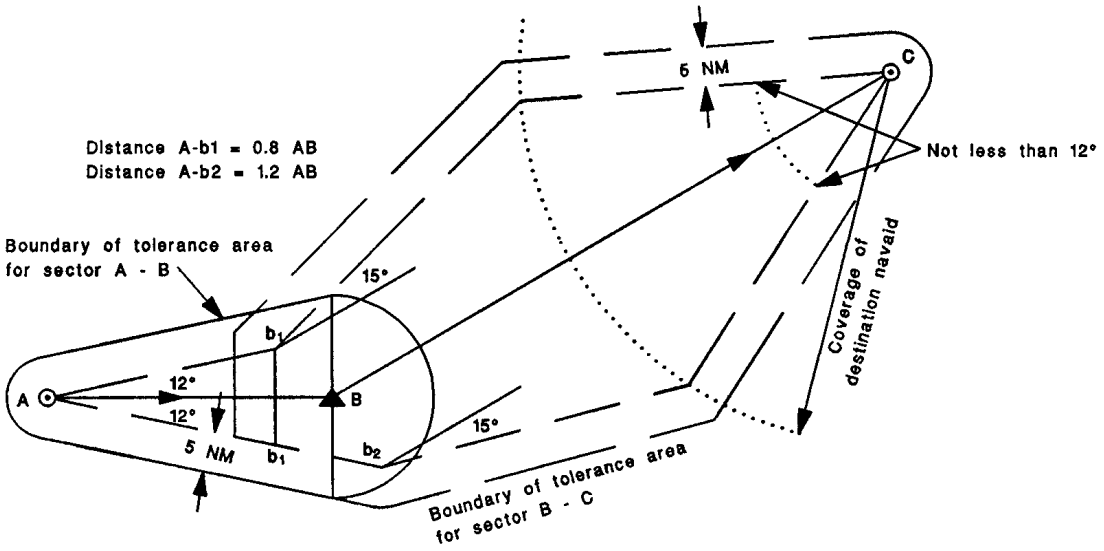
Example 10 : Route segment with intermediate reporting point (no position fix). The basic area for A – B is ADEF and, for B – C, is GDCF.



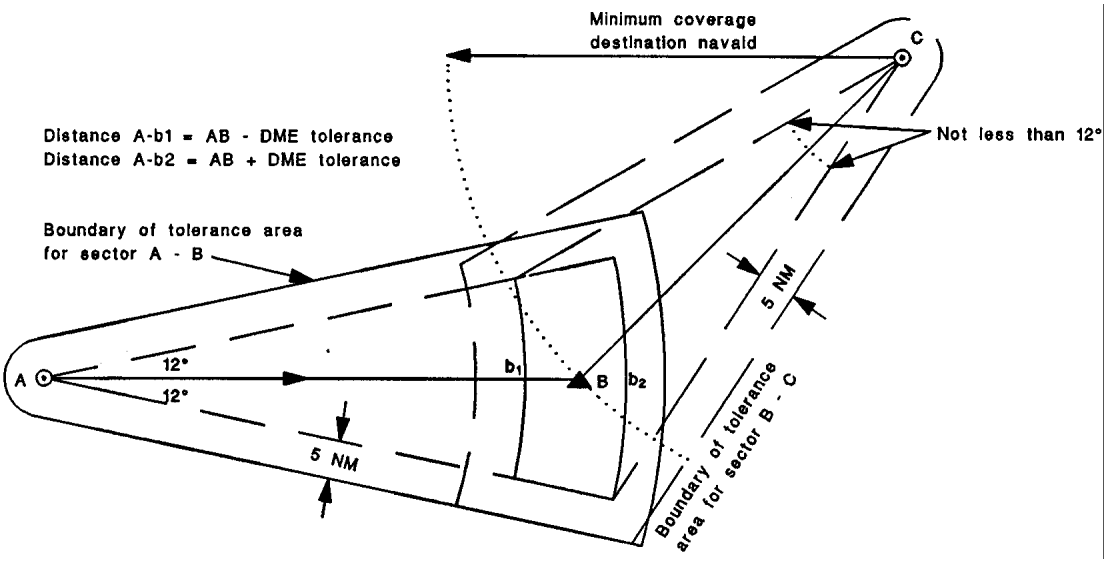
Example 11 : Route segment with change of direction at DR position. Coverage of destination navaid not less than length of second sector of route segment.



Example 12 : Route segment with change of direction at DR position. Coverage of destination navaid less than length of second sector of route segment.



Example 13 : Route segment with change of direction at DME/Azimuth aid fix. Coverage of destination navaid not less than length of second sector of route segment. NB Diagram shows DME at A – the DME fix area would be different if DME is in a different position.



Example 14 : Route segment with change of direction at DME/Azimuth aid fix. Coverage of destination navaid less than length of second sector of route segment. NB Diagram shows DME at A – the DME fix area would be different if DME is in a different position.