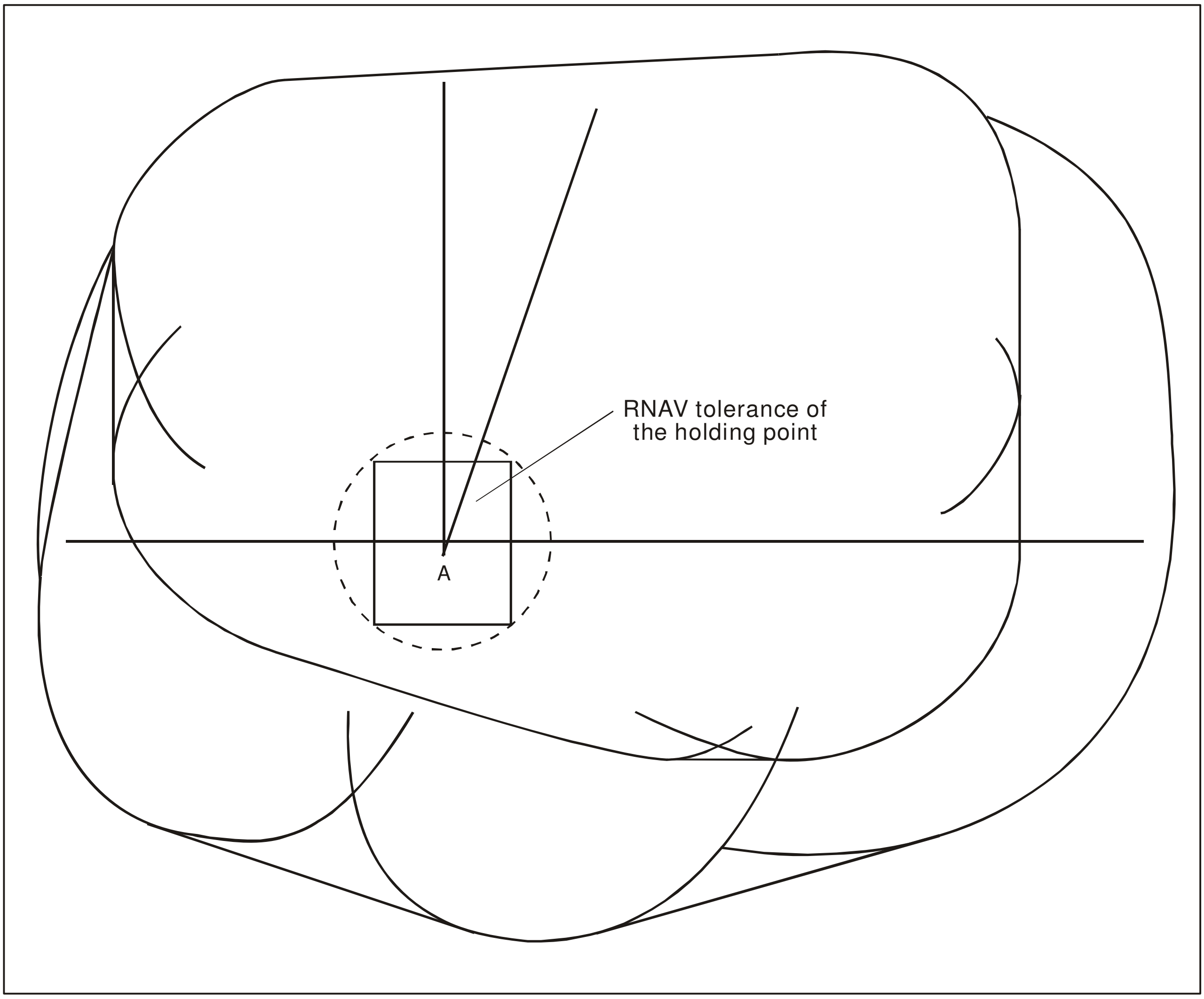

Figure III-3-7-7. RNAV holding area including protection of entry procedures

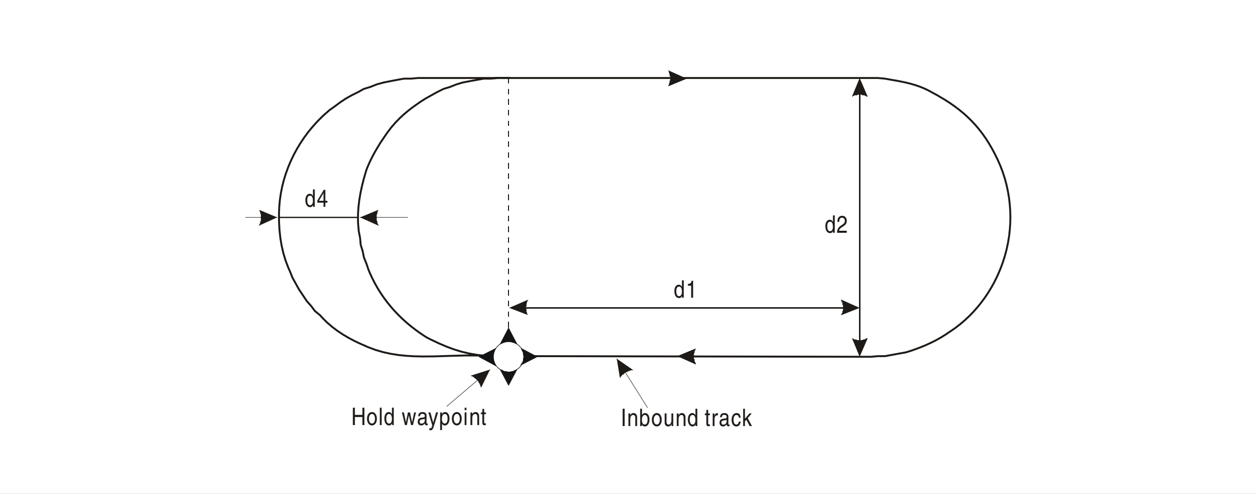

Figure III-3-7-8. Maximum track of an RNP holding

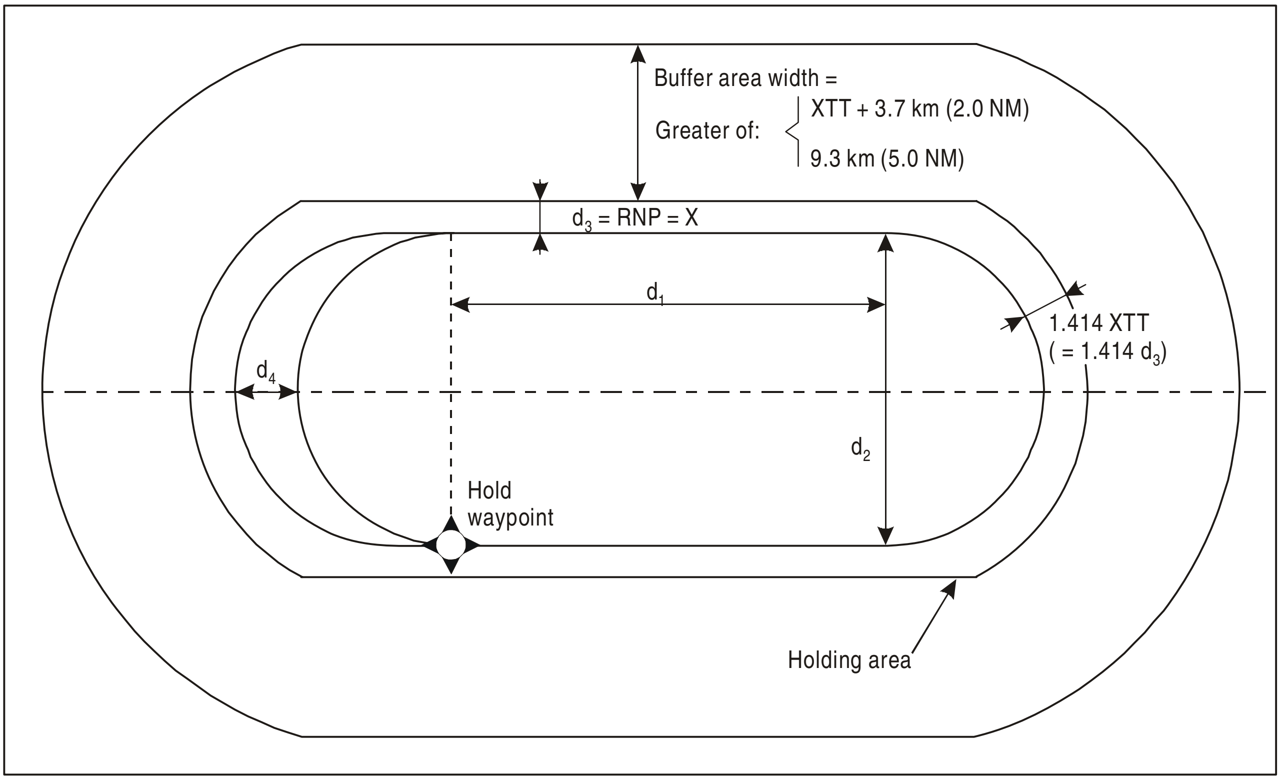

Figure III-3-7-9. RNP holding area — obstacle clearance area

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Appendix to Chapter 7

EXAMPLE OF ALTERNATIVE AREA NAVIGATION (RNAV) HOLDING ENTRIES FOR REDUCED HOLDING ENTRY AREAS

1.1 INTRODUCTION

1.1.1 Conventional entries described in Part II, Section 4, Chapter 1 are based on the fact that for VOR or NDB procedures, it is necessary to overfly the station or holding fix at the beginning of the entry. This requires additional protection for entry procedures with these types of holdings.

1.1.2 With a suitable RNAV system, it is no longer necessary to overfly the station or holding waypoint. This Attachment gives an example of alternative entries which are less ‘‘space consuming’’ than the conventional ones. This material is presented for the purpose of information to manufacturers. A date for operational use will be established in the future.

1.2 DEFINING THE ENTRY SECTORS

a) Draw the outline of the holding pattern (see Figure III-3-7-App-1); and

b) draw a line making an angle of 70° with the axis of the inbound leg through the holding waypoint.

These two lines divide the space into four sectors: (1, 2, 3 and 4) as shown.

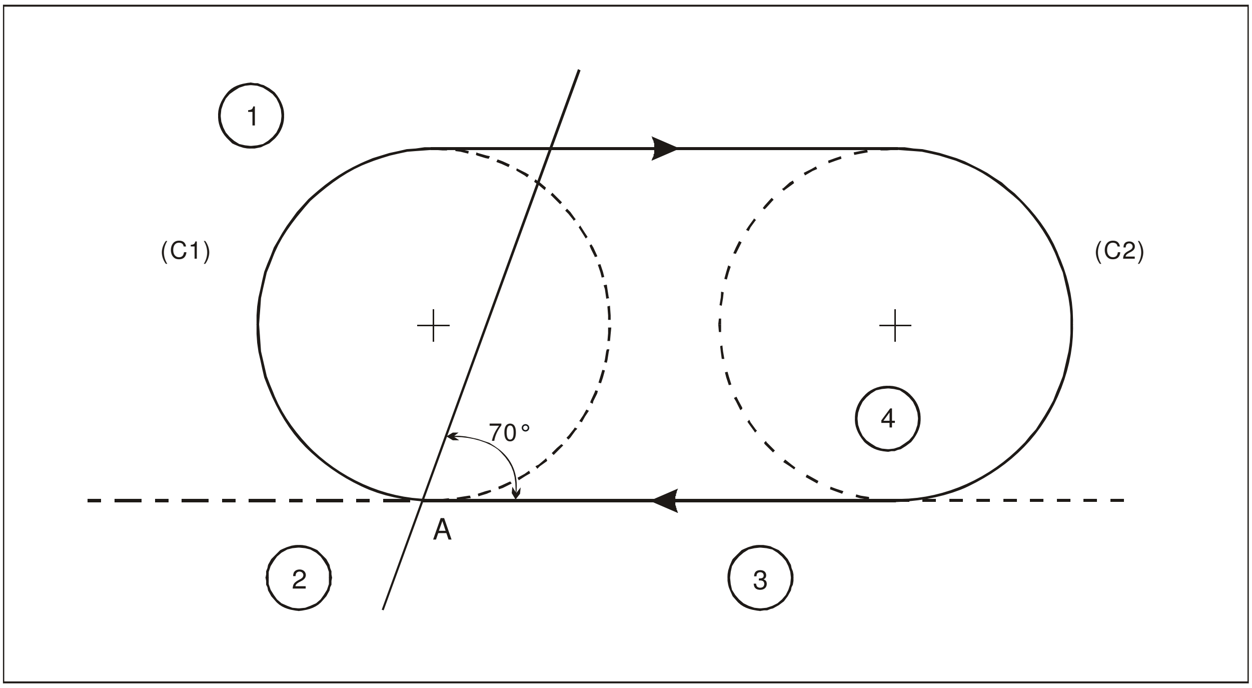

Figure III-3-7-App-1. Entry sectors

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Chapter 8

EN-ROUTE PROCEDURES

8.1 GENERAL

8.1.1 Application

The criteria assume the use of any kind of sensor (such as VOR/DME, DME/DME, etc.). The general criteria of Part II, Section 3, "Enroute criteria" apply with the following modification: on the straight segments, the area has a constant width (angular limits do not apply).

Note.— For RNP applicable to the en-route phase of flight, see the Manual on Required Navigation Performance (RNP) *(Doc 9613).*

8.1.2 Standard conditions

8.1.2.1 *RNAV procedures.* The standard assumptions for RNAV systems which are not RNP-approved are that the RNAV system must be approved for the en-route phase and must comply with the navigation accuracy to follow conventional routes (VOR, NDB).

8.1.2.2 *RNP procedures.* The standard assumptions on which RNP en-route procedures are developed are:

a) the fix tolerance area of the waypoint is a circle of radius equal to the en-route RNP;

b) the system provides information which the pilot monitors and uses to keep the FTT within the limits set during system certification; and

c) en-route procedures are normally based on RNP 4 or higher. Where necessary and appropriate, they may be based on RNP 1.

8.1.3 Secondary areas

For areas based on RNP criteria, the general principle of secondary areas is applied. For RNAV procedures, the criteria of Part II, Section 3, "Enroute criteria" apply.

8.1.4 Definition of turns

Two kinds of enroute turns are specified:

a) the turn at a fly-by waypoint;

b) the controlled turn (for RNP 1 routes only).

8.1.5 Turn at a fly-by waypoint

8.1.5.1 *General*

8.1.5.1.1 A turn at a fly-by waypoint takes into account turn anticipation by adding a distance rtan (A/2) before the waypoint. This determines point S (see Figure III-3-8-1). The earliest turning point (K-line) is located at a distance ATT before point S.

8.1.5.1.2 The criteria for the straight segment (RNAV and RNP) apply until:

a) a distance of ATT + c after point S for the outer side of the turn; and

b) the earliest TP (a distance of ATT before point S) for the inner side of the turn;

where c is a distance corresponding to a 10-second pilot reaction time.

8.1.5.2 *Turn outer boundary*

8.1.5.2.1 On the outside of the turn, turn construction starts from the limits of the primary area at the following distance before the waypoint:

a) rtan (A/2) – ATT – c for turn angles less than or equal to 90 degrees; and

b) r –ATT–c for turn angles more than 90 degrees;

where c is a distance corresponding to a 10-second pilot reaction time
r is the radius of the turn

8.1.5.2.2 From these points wind spirals or bounding circles are constructed as described in Part I, Section 2, Chapter 3, "Turn area construction".

8.1.5.2.3 Additionally, in order to protect the aircraft within the required range of speeds, the outer limit of the primary area is extended until it intersects with that tangent of the wind spiral (or bounding circle) which is parallel to the nominal track after the turn.

8.1.5.2.4 The secondary area has a constant width during the turn.

8.1.5.3 *Turn inner boundary*

8.1.5.3.1 On the inner edge of the turn, the primary area boundary starts at the earliest TP (K-line), and makes an angle of half the angle of turn (A/2) with the nominal track after the turn.

8.1.5.3.2 If this boundary does not connect to the boundary of the next segment, the area boundaries make an angle of 15 degrees splay with the nominal track of the next segment.

8.1.6 Controlled turn (for RNP 1 routes)

8.1.6.1 This paragraph only applies to RNP. The radius of a controlled (fixed radius) turn for RNP 1 routes is equal to:

a) 28 km (15 NM) at and below FL 190; and

b) 41.7 km (22.5 NM) at and above FL 200.

See Annex 11, Appendix 1, 2.4.

8.1.6.2 *Turn boundary construction*

Fixed radius turns are constructed by first delimiting the edges of the primary area, and then adding a secondary area to both sides (see Figure III-3-8-2).

a) *Outer boundary of the primary area.* The outer edge of the primary area is defined by the segment of a circle:

   1) centred on point O;

   2) having the radius r + [ATT + 1.9 km (1.0 NM)] / cos 45]; and

   3) delimited by the edges of the adjacent straight segments (points J and M).

b) *Inner boundary of the primary area.* The inner edge of the primary area is defined by the segment of a circle:

   1) having the radius r;

   2) centred on point I at a distance of [ATT +1.9 km (1.0 NM)] / cos 45] from the centre of the turn (point O); and

   3) delimited by the edges of the adjacent straight segments (points P and R).

c) *Secondary areas within the turn.* Secondary areas are added to edges of the primary area to establish the turn outer and inner boundaries. The secondary areas maintain a constant width of ATT + 1.9 km (1.0 NM).

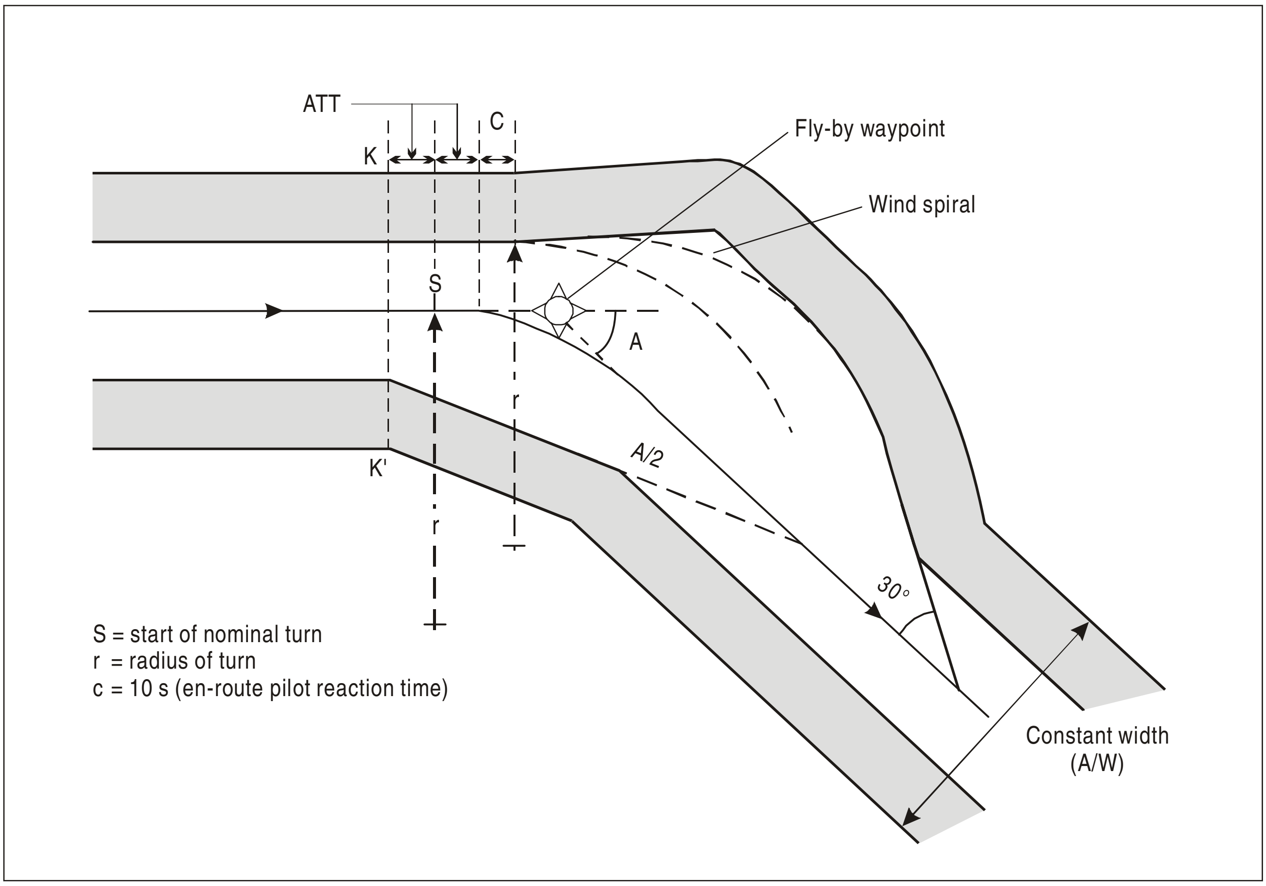


Figure III-3-8-1. Turn at a fly-by waypoint

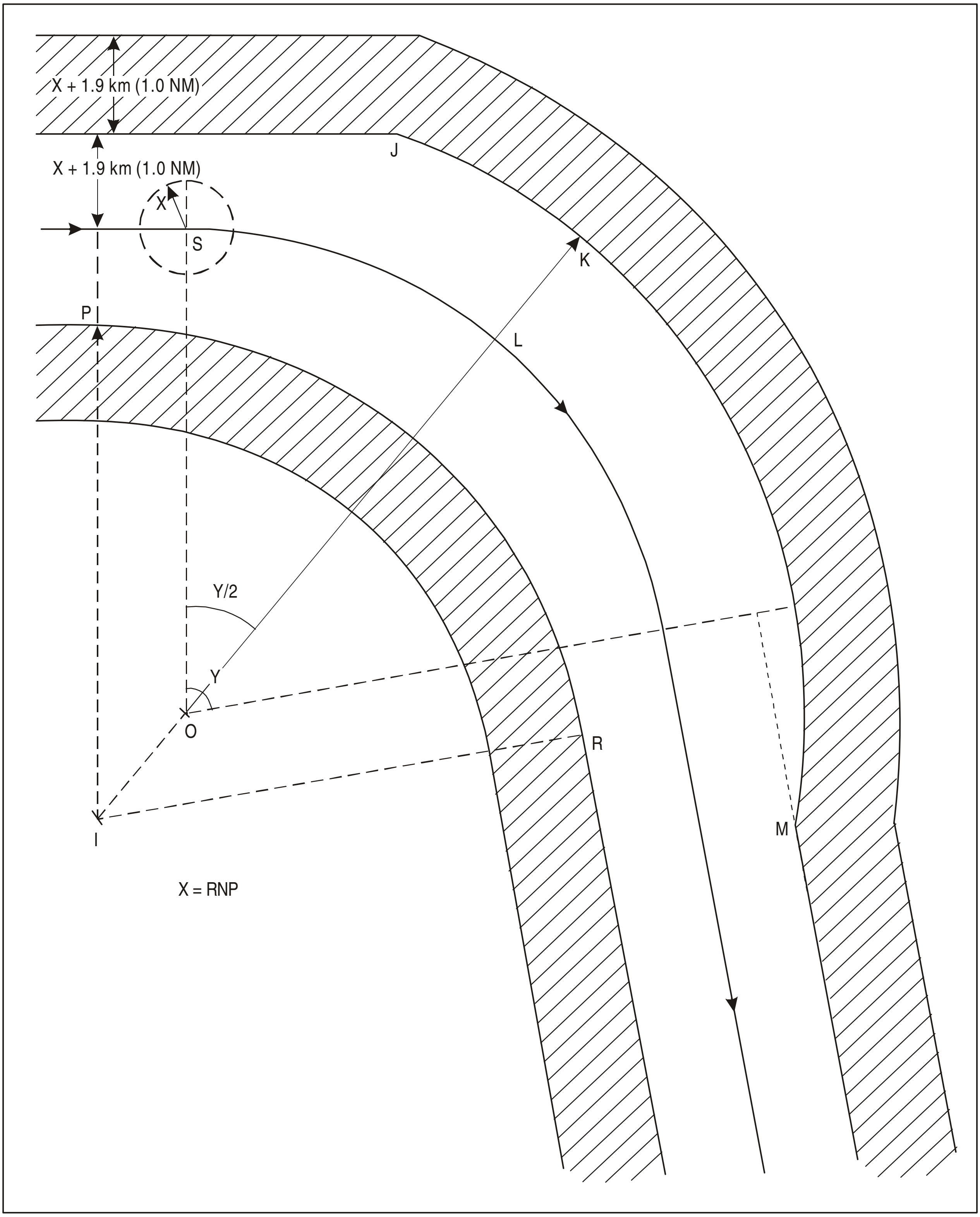


Figure III-3-8-2. Obstacle clearance area associated with a controlled turn

Section 4

QUALITY ASSURANCE

(To be developed)

Section 5

PUBLICATION

Chapter 1

RNAV DATABASE PATH TERMINATOR CONCEPT

RNAV procedure designers should use the following aviation industry guidelines:

a) every route segment should proceed from a waypoint to a waypoint;

b) avoid large angle changes (greater than 90°) ;

c) do not use conditional transitions, such as "climb to XXXX feet by an XX DME", or "at XX DME but not below XXXX feet, turn right direct to (waypoint)";

d) procedures should be developed in such a way that they can easily and properly be coded into the appropriate path terminator and route type;

e) all details of any specific restrictions applied to a procedure shall be published; and

f) procedure textual description should comply with the applicable path terminator as shown below:

Published procedure description	*Path terminator used*	*Path terminator meaning*
From (navaid to waypoint)	IF	Initial fix
To (point) on track XXX°	CF	Course to fix
Direct to (waypoint)	DF	Direct to fix
To (waypoint)	TF	Track to fix
Via (fixed radius) left/right turn to (waypoint, centred on latitude/longitude, radius in NM)*	RF	Radius to fix
From (waypoint) to (altitude/flight level) on track XXX°	FA	Fix to altitude (climb)

* This particular leg type has not been fully implemented. It will likely be used in RNP but not RNAV procedures.

Chapter 2

WAYPOINT NAMES

(To be developed)

Chapter 3

PROCEDURE NAMING

3.1 GENERAL

The criteria of Part I, Section 4, Chapter 9, "Charting/AIP" apply as modified by the contents of this chapter.

3.2 RNAV DEPARTURES

3.2.1 For RNAV departures, a text description shall be published clearly stating the intent and requirements of the procedure. (This is to ensure that database coding will be executed correctly.) For an example of appropriate textual description, see Figure III-5-3-1.

Note.— Unless otherwise stated, all waypoints are fly-by waypoints.

3.2.2 RNAV departure charts shall include the term RNAV in the title. If the departure routes are restricted to specific sensor types, these radio navigation aid types shall be included, in subscript parentheses, in the title. For example:

RNAV $_{\text{(GNSS , DME/DME)}}$ STANDARD INSTRUMENT DEPARTURES

Note.— The sensor does not form part of the ATC clearance.

3.2.3 Separate charts should only be published if the routes differ laterally or vertically. When operationally required, separate charts may be published for each sensor or for a combination of sensors.

3.2.4 RNP departures shall include the term RNAV in the title, for example: RNAV STANDARD INSTRUMENT DEPARTURES. The RNP value shall be published on the chart either above each leg of the procedure or, if the same RNP value applies to all legs, as a single text block, for example: "RNP 1 required for all procedures".

3.3 RNAV ARRIVALS

3.3.1 RNAV arrivals shall include the word RNAV in the title. If the routes are restricted to specific sensor types, these radio navigation aid types shall be included, in subscript parentheses, in the title. For example:

RNAV $_{\text{(GNSS , DME/DME)}}$ STAR

Note. — The sensor does not form part of the ATC clearance.

3.3.2 Separate charts should only be published if the routes differ laterally or vertically. When operationally required, separate charts may be published for each sensor or for a combination of sensors.

3.3.3 RNP arrivals shall include the word RNAV in the title, for example:

RNAV STAR

3.3.4 The RNP value shall be published on the chart either above each leg of the procedure or, if the same RNP value applies to all legs, as a single text block, for example: RNP 1 required for all procedures.

3.4 RNAV APPROACH

3.4.1 RNAV approaches shall be identified by the term RNAV in the title. The radio navigation aid upon which the approach procedure is based shall be included, in subscript parentheses, in the title, for example:

RNAV $_{\text{(GNSS)}}$ Rwy 20 or RNAV $_{\text{(GNSS CLASS B and C only)}}$ Rwy 20

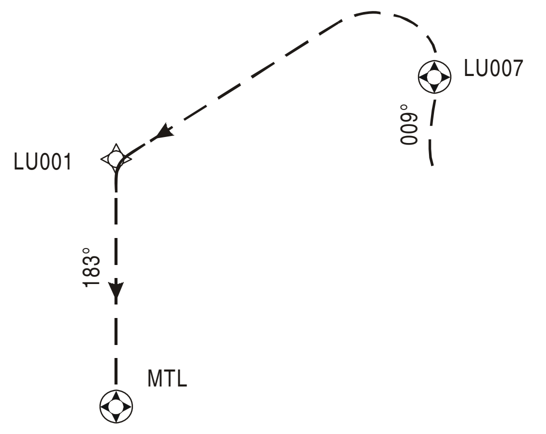
Note.— The sensor does not form part of the ATC clearance.

3.4.2 The minimum box on the chart shall include OCA/H values for each applicable navigation type.

3.4.3 RNP approaches shall include the term RNAV in the title, for example:

RNAV Rwy 36L.

The minimum box on the chart shall include OCA/H values for each applicable RNP value.



(Departure): Climb on runway axis. At the LU007 flyover waypoint, turn left towards the LU001 fly-by waypoint and join the route LU001/MTL.

Figure III-5-3-1. Text description

Procedures for
Air Navigation Services

AIRCRAFT OPERATIONS

Part IV

HELICOPTERS

Chapter 1

AREA NAVIGATION (RNAV) POINT-IN-SPACE (PinS) APPROACH PROCEDURES FOR HELICOPTERS USING BASIC GNSS RECEIVERS

1.1 GENERAL

1.1.1 The general criteria in Part I, Section 4, as well as Part III, Section 2, Chapter 2, as amplified or modified by the criteria in this chapter apply to area navigation (RNAV) approach procedures for basic GNSS receivers. These specified instrument procedures may be developed for the use of helicopters. It is intended that these specified procedures be designed using the same conventional techniques and practices for aeroplane categories as those explained elsewhere in this document.

1.1.2 *Helicopter specific parameters.* Parameters such as airspeed, fix tolerances, area widths and descent and climb gradients are specified in this chapter for exclusive use in designing helicopter procedures. These specifications have been defined in accordance with the helicopter performance characteristics and the operational requirements to perform the procedure.

1.1.3 *Approach speeds.* When the helicopter reaches the obstacle clearance altitude/height (OCA/H), it must have a sufficient distance to decelerate and transition to flight by visual reference. The greater the approach speed on final, the larger the required deceleration distance. Criteria are provided in this chapter to accommodate helicopters flying the final and missed approach segments at speeds not to exceed 90 KIAS and for those flying the final and missed approach segments at speeds not to exceed 70 KIAS. The missed approach airspeed limitation applies until the helicopter is established on the inbound course to the missed approach holding waypoint or clearance limit.

1.1.4 *Fix identification.* Part III, Section 1, Chapter 1, 1.1, “Fix identification” applies.

1.1.5 *Secondary areas*. The general criteria for secondary areas apply as modified or amplified in this chapter.

1.1.6 *Certification/operational approval.* The aircraft equipped with a basic GNSS receiver as described in Part III, Section 1, Chapter 2, that have been approved by the national authority for the operator for the appropriate level of GNSS operations may use these systems to carry out approaches.

1.2 GNSS RNAV SYSTEM ACCURACY

1.2.1 The criteria in Part III, Section 1, Chapter 2, apply as modified or amplified in this chapter. The total system tolerance components are listed in Table IV-1-1.

1.3 ARRIVAL ROUTES

1.3.1 The provisions of Part III, Chapter 3 apply, using an area semi-width of 14.82 km (8.00 NM) if the IAF is more than 55.56 km (30.00 NM) from the PRP or 4.63 km (2.50 NM) if the IAF is less than 55.56 km (30.00 NM) from PRP. See Figure IV-1-1 for arrival routes and initial approach segment widths.

1.3.2 *Minimum sector altitude/terminal arrival altitude*. For the application of the minimum sector altitude, the provisions of Part III, Chapter 9 apply except that only a single omnidirectional sector shall be established. The sector is centered on the PRP/MAPt. The PRP/MAPt must be provided in the database as the reference point serving the same purpose as the ARP in approaches to aerodromes. For the application of the terminal area altitude the provisions of Part III, Section 2, Chapter 4 apply.

1.4 TERMINAL CRITERIA

1.4.1 *Approach configuration.* The basic T/Y approach configuration affords flexibility and standardization of procedure design and should therefore be considered as the first option in procedure design.

1.4.2 *Holding*. For holding patterns, the track specified for the inbound leg should be the same as the track for the initial segment if the holding fix is the IAF or the intermediate segment if the holding fix is the IF. The track for the inbound leg should not differ from the initial or the intermediate track, as appropriate, by more than 30º.

1.4.3 The initial and intermediate segments have minimum lengths to accommodate turn distance/minimum stabilization distance (MSD). The length of the turning component is the minimum stabilization distance for the angle turn at the IAF and IF can be determined from the formulas in Part III, Section 2, Chapter 1.

1.4.4 The outer boundary of turn areas is designed using a wind spiral or a bounding circle derived by applying an omnidirectional wind to the ideal flight path. On the outer edge of the turn, and after the turn in the case of an overshoot, wind spirals are constructed from the limits of the primary area, based on the parameters of Part I, Section 4, Chapter 3, 3.6.2 a) through g), and at a distance equal to: [min(r, r tan(/2)) - ATT - d(s)] before the waypoint. Additionally, in order to protect the aircraft within the required range of speeds, the outer limit of the primary area is expanded as shown in Figure IV-1-2, and a constant secondary area is applied during the turn.

1.5 INITIAL APPROACH SEGMENT

1.5.1 The initial approach segment begins at the IAF and ends at the IF.

1.5.2 *Alignment.* The initial track shall not differ from the intermediate segment track by more than 120°.

1.5.3 *Area.* See Figure IV-1-2 for the areas of initial, intermediate and final approach segments.

1.5.3.1 *Length.* The initial approach segment should not exceed 18.52 km (10.00 NM), unless operational requirements make a longer segment necessary. Construct the IAF within 46.30 km (25.00 NM) of the PRP. The minimum length is governed by the magnitude of the turn required at the IAF. The initial approach segment is designed for helicopters flying the procedure at speeds up to 220 km/h (120 KIAS). Where an operational requirement exists, the segment may be designed for an airspeed not exceeding 165 km/h (90 KIAS), in which case the approach plate will be annotated "Speed limited to 165 km/h (90 KIAS)".

1.5.3.2 *Area width.* The area semi-width is 14.82 km (8.00 NM) for regions where the nominal track is more than 55.56 km (30.00 NM) from the PRP and 4.63 km (2.50 NM) for regions where the nominal track is equal to or less than 55.56 km (30.00 NM) from PRP. The area boundaries converge at an angle of 30º to the track beginning at the point where the nominal track crosses within 55.56 km (30.00 NM) of the PRP and continuing until reaching ±4.63 km (2.50 NM).

1.5.4 *Obstacle clearance*. The area considered for obstacle clearance extends from the earliest IAF to the nominal position of IF. The general criteria for obstacle clearance applies, see Part I, Section 4, Chapter 3, 3.3.4. Obstacle clearance required in the primary area is 300 m (1 000 ft), tapering uniformly to zero from the edge of the primary area to the outer edge of the secondary area.

1.5.5 *Descent gradient*. Optimum descent gradient is 6.5 per cent (400 ft/NM). Where a higher descent gradient is required, the recommended maximum is 10 per cent (600 ft/NM); however, where an operational requirement exists, a gradient of as much as 13.2 per cent (800 ft/NM) may be authorized, provided the gradient used is depicted on approach charts.

1.6 INTERMEDIATE APPROACH SEGMENT

1.6.1 The intermediate segment begins at the IF and ends at the FAF. A fly-by waypoint is recommended at the IF unless an operational imperative exists to use a flyover waypoint.

Note.— The FAF is always defined by a fly-by waypoint, even if there is no turn over the FAF.

1.6.2 The intermediate approach segment should be aligned with the final approach segment. If a turn at the FAF is necessary, it shall not exceed 60°.

1.6.3 *Area*. See Figure IV-1-3, Intermediate and final segments.

1.6.3.1 *Length*. The optimum length is 5.56 km (3.00 NM). It shall not be less than 3.70 km (2.00 NM), and shall not exceed 18.52 km (10.00 NM). The minimum length is governed by the magnitude of the turn required at the IF. The intermediate approach segment is designed for helicopters flying the procedure at speeds up to 220 km/h (120 KIAS). Where an operational requirement exists, the segment may be designed for an airspeed not exceeding 165 km/h (90 KIAS), in which case the approach plate will be annotated "Speed limited to 165 km/h (90 KIAS)".

1.6.3.2 *Width.* The area width is formed by joining the boundaries of the initial area of the IF and the final area at the nominal FAF.

1.6.4 *Obstacle clearance*. The area considered for obstacle clearance extends from the earliest IF to the nominal position of FAF. The general criteria for obstacle clearance applies, see Part I, Section 4, Chapter 4, 4.3.2, "Obstacle clearance". The obstacle clearance in the primary area is 150 m (492 ft), tapering uniformly to zero from the edge of the primary area to the outer edge of the secondary area.

1.6.5 *Descent gradient*. Because the intermediate approach segment is used to prepare the aircraft speed and configuration for entry into the final approach segment, this segment should be flat. If a descent gradient is necessary, the maximum permissible gradient will be 10 per cent (600 ft/NM). When an operational requirement exists, a gradient of as much as 13.2 per cent (800 ft/NM) may be authorized, provided the gradient used is depicted on approach charts. The descent gradient should be calculated in accordance with Part III, Section 2, Chapter 3, 3.3.3, "Descent gradient".

1.7 FINAL APPROACH SEGMENT

1.7.1 The final approach segment begins at the FAF (fly-by) and ends at the MAPt (flyover). All approaches will be to a point in space where the pilot should have sufficient visual reference to continue the approach and landing to the intended landing site or initiate a missed approach.

1.7.2 *Alignment.* For point-in-space approaches there are no alignment requirements in the final approach segment.

1.7.3 *Area*. See Figure IV-1-3.

1.7.3.1 The area considered for obstacle clearance begins at the earliest FAF position and ends at the nominal position of the MAPt.

1.7.3.2 *Length.* The optimum length is 5.92 km (3.20 NM). The minimum length is governed by the magnitude of the turn required at the FAF. Procedures are normally designed for helicopters flying the approach up to 130 km/h (70 KIAS). For specific cases, where the final may be designed to accommodate speeds up to 165 km/h (90 KIAS), the missed approach must also be designed to accommodate 165 km/h (90 KIAS). The maximum speed for which the final and missed approach segments are designed must be clearly annotated on the approach chart.

1.7.3.3 *Width*. The area semi-width begins at 1.85 km (1.00 NM) at the nominal position of the FAF and tapers to 1.67 km (0.90 NM) at the nominal position of the MAPt. For procedures designed to accommodate 165 km/h (90 KIAS) final approach speed the area semi-width begins at ± 2.23 km (1.20 NM) at the nominal FAF and reaches ± 2.04 km (1.10 NM) at the nominal position of MAPt.

Note.— The width of the area semi-width at the MAPt is slightly greater than the one corresponding to the fixed-wing GNSS criteria as the maximum authorized angle at the FAF is 60° instead of 30°.

1.7.4 *Obstacle Clearance*. Primary area minimum obstacle clearance (MOC) is 75 metres (246 ft) tapering uniformly to zero from the edge of the primary area to the outer edge of the secondary area.

1.7.5 *Descent gradient.* Optimum descent gradient is 6.5 per cent (400 ft/NM). Where a higher descent gradient is necessary, the recommended maximum is 10 per cent (600 ft/NM). However, where an operational imperative exists, and the magnitude of turn at the FAF is less than or equal to 30°, a gradient of as much as 13.2 per cent (800 ft/NM) may be authorized, provided the gradient used is depicted on approach charts. The final segment gradient is calculated from the FAF altitude at the plotted position of the FAF to the OCA/H at the plotted position of the MAPt.

1.8 MISSED APPROACH SEGMENT

1.8.1 *General.* The missed approach segment begins at the earliest MAPt (flyover) position and ends at a holding point designated by an MAHF (flyover) or to a clearance limit. Optimum routing is straight ahead to a direct entry into holding at the MAHF.

1.8.2 *Longitudinal tolerance of the MAPt*. The longitudinal tolerance of the MAPt will be calculated as described at Part I, Section 4, Chapter 6, 6.1.6.2.1, "MAPt tolerance when MAPt defined by a navigational facility or fix".

1.8.3 *Calculation of start of climb (SOC*). The SOC point will be calculated as described at Part I, Section 4, Chapter 6, 6.1.6.2, "Determining SOC with an MAPt defined by a navigation facility or fix", except that the transitional tolerance (X) is the distance a helicopter traverses during 5 seconds of flight at 130 km/h (70 KIAS) or 165 km/h (90 KIAS) converted to TAS.

1.8.4 *Missed approach area*. The missed approach area shall commence at the beginning of the MAPt longitudinal tolerance at a width equal to the final approach area at that point. At that point, the area splays at 15° on each side of the missed approach course, to account for the decrease in GNSS receiver display sensitivity from ± 0.56 km (0.30 NM) to ± 1.85 km (1.00 NM) to a total width of ± 4.63 km (2.50 NM). If the first waypoint is reached prior to the area reaching ± 4.63 km (2.50 NM) the splay continues to 4.63 km (2.50 NM). For missed approach procedures with GNSS receivers which do not provide continuous track guidance after the MAPt see Figures IV-1-4 and IV-1-5. Turning missed approach with track specified to MAHF should be restricted to systems providing continuous track guidance after the missed approach waypoint and the approach procedure should be clearly annotated. See Figure IV-1-6.

1.8.5 *Straight missed approach*. The criteria governing straight missed approach apply (see Part I, Section 4, Chapter 6, 6.3, "Straight missed approach"). Note also that track guidance is available for the missed approach by the nomination of a GNSS fix(es).

1.8.6 *Turning missed approach.* The turn calculations are based on the turn parameters in Part I, Section 4, Chapter 6, 6.4.2. The wind spiral or bounding circle is applied to the boundary of the primary area, and the outer boundary of the secondary area is constructed by applying a constant width area. For missed approach procedures with GNSS receivers which do not provide continuous track guidance after the MAPt, see Figures IV-1-4 and IV-1-5. Turning missed approach with track specified to MAHF should be restricted to systems providing continuous track guidance after the missed approach waypoint and the approach procedure should be clearly annotated. See Figure IV-1-6.

1.8.6.1 *Turn parameters.*

1.8.6.1.1 *Indicated airspeed*. The speed for the final missed approach is 165 km/h (90 KIAS). However, where operationally required to avoid obstacles, reduced speeds as slow as 130 km/h (70 KIAS) may be used, provided the procedure is annotated "**Missed approach turn limited to 130 km/h (70 KIAS) maximum**".

1.8.6.1.2 *Alignment*. The maximum difference between the inbound track and outbound track at MATF is a maximum of 120º.

1.8.6.1.3 *Length.* Where an operational requirement exists to avoid obstacles, an MATF may be used. In this case, the MSD for the turn point must be applied after SOC. The minimum length after the turn is determined by the MSD required for the outbound segment. Refer to the method in Part III, Section 2, Chapter 1.

1.8.7 *Climb gradient*. The nominal climb gradient of the missed approach surface is 4.2 per cent (24:1). Higher gradients may be considered with operational approval when an operational requirement exists. When a gradient other than the nominal gradient is used in the construction of the missed approach procedure the gradient required must be annotated on the instrument approach chart. In addition to the OCA/H for the specified gradient, the OCA/H applicable to the nominal gradient must also be shown.

1.8.8 The MOC is 40 m (130 ft) for turns exceeding 15°. (See Part I, Section 4, Chapter 6.)

1.9 PROMULGATION

1.9.1 *Procedure identification.* For helicopter point-in-space approaches, the title of the IAC should include the final approach course (three numeric characters); e.g., RNAV (GNSS) 036. If the approach is restricted to Class B and C receivers this shall be included in sub-script parentheses, in the title. For example:

RNAV $_{\text{(GNSS Class B \&C only)}}$ 023

The term "CAT H" should be prominently displayed in the plan view but not be included in the title, and the minimums should include the term CAT H. The point-in-space approach procedures shall not be published on the same IAP chart as aeroplane (CAT A, B, C, D) and helicopter (CAT H) procedures to runways.

Note.— The sensor does not form part of the ATC clearance.

1.9.2 For point-in-space approaches annotated "Proceed visually from (MAPt)" any number of heliports may be served by the procedure. Enter the heliport name(s), heliport elevation(s), and the bearing (to the nearest degree) and distance (to the nearest two-tenths of a kilometer (tenth NM)) from MAPt to the Aerodrome Reference Point (ARP) of the heliport; e.g. **MCCURTAIN MEMORIAL HOSPITAL, ELEV 693', 123/3.2**.

1.9.3 *Speed limitation*. The speed limitation must be clearly indicated on the published IAP chart. For example "The final and missed approach airspeed must not exceed xx KIAS".

1.9.4 *Descent gradient.* Where an operational requirement exists, a gradient of as much as 13.2 per cent (800 ft/NM) may be authorized, provided that the gradient used is depicted on the approach chart.

Table IV-1-1. Total system tolerances and area semi-widths for basic GNSS receivers

	IAF (1) ≥ 30 NM from PRP	*IAF (2) < 30 NM from PRP*	*Fix in initial segment*	*IF*	*FAF*	*MAPt*	*Fix in missed approach or departure < 30 NM from PRP*	*Fix in missed approach or departure ≥ 30 NM from PRP*
Navigation system accuracy (3) (km/NM)	0.23/0.12	0.23/0.12	0.23/0.12	0.23/0.12	0.23/0.12	0.23/0.12	0.23/0.12	0.23/0.12
Integrity monitor alarm limit (km/NM)	3.70/2.00	1.85/1.00	1.85/1.00	1.85/1.00	0.56/0.30	0.56/0.30	1.85/1.00	3.70/2.00
Time to alarm	30 sec	10 sec	10 sec	10 sec	10 sec	10 sec	10 sec	30 sec
FTT (km/NM)	3.70/2.0	0.46/0.25	0.46/0.25	0.46/0.25	0.37/0.20	0.28/0.15	0.46/0.25	3.70/2.00
ATT (km/NM)	3.70/2.00	1.85/1.00	1.85/1.00	1.85/1.00	0.56/0.30	0.56/0.30	1.85/1.00	3.70/2.00
XTT (km/NM)	7.41/4.00	2.32/1.25	2.32/1.25	2.32/1.25	0.93/0.50	0.84/0.45	2.32/1.25	7.41/4.00
Area semi-width (km/NM)	14.82/8.00	4.63/2.50 (4)	4.63/2.50 (4)	4.63/2.50 (4)	1.85/1.00 (5)	1.67/0.90 (4) (5)	4.63/2.50 (4)	14.82/8.00 (4)

ATT = integrity monitor alarm limit (IMAL)
XTT = IMAL + FTT
area semi width = 2XTT

(1) IAF positioned outside 55.56 km (30.00 NM) radial distance from the destination point-in-space reference point (PRP).
(2) IAF positioned within 55.56 km (30.00 NM) radial distance from the destination PRP.
(3) Includes all system computation tolerances.
(4) Based on helicopter flight trials and operational experience, which included turns onto the initial approach segment, the operational assessment leads the use of 2XTT when using basic GNSS receivers.
(5) For approach speeds greater than 130 km/h (70 KIAS) but less than or equal to 165 km/h (90 KIAS), the semi-width at FAF is 2.22 km (1.20 NM), and the semi-width at the MAPt is 2.04 km (1.10 NM).

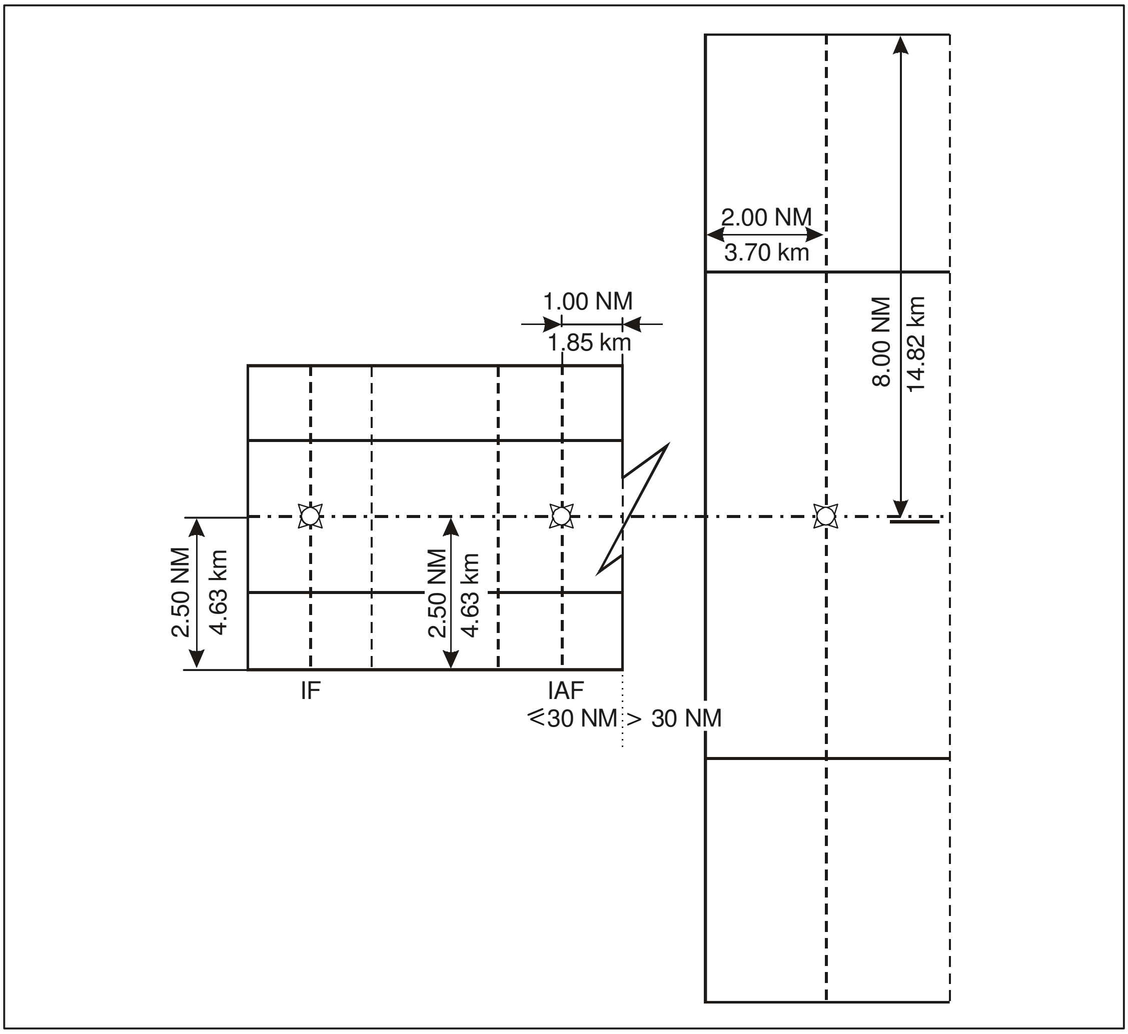


Figure IV-1-1. Arrival routes, initial approach segment widths and fix tolerance

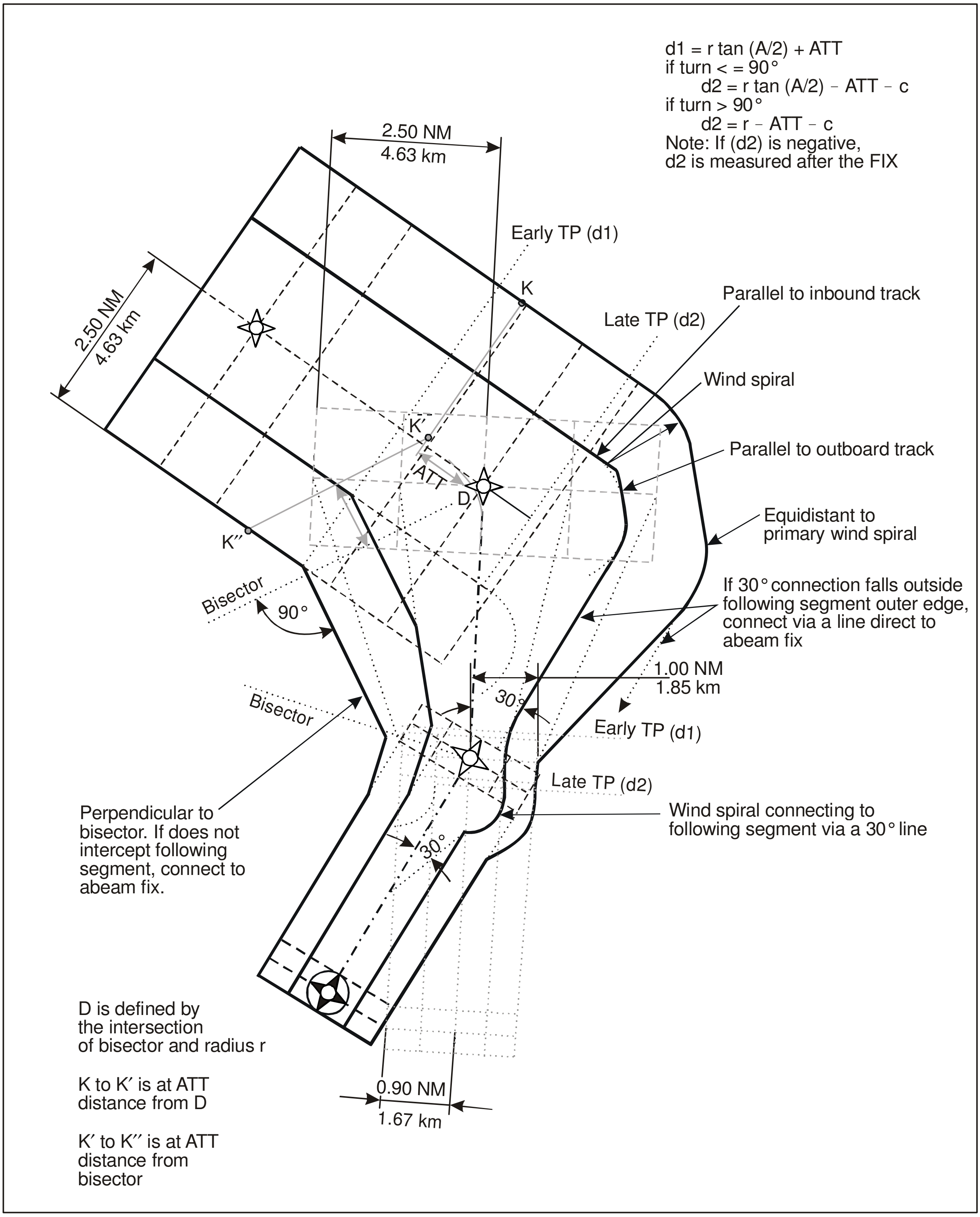


Figure IV-1-2. Initial, intermediate and final approach segments

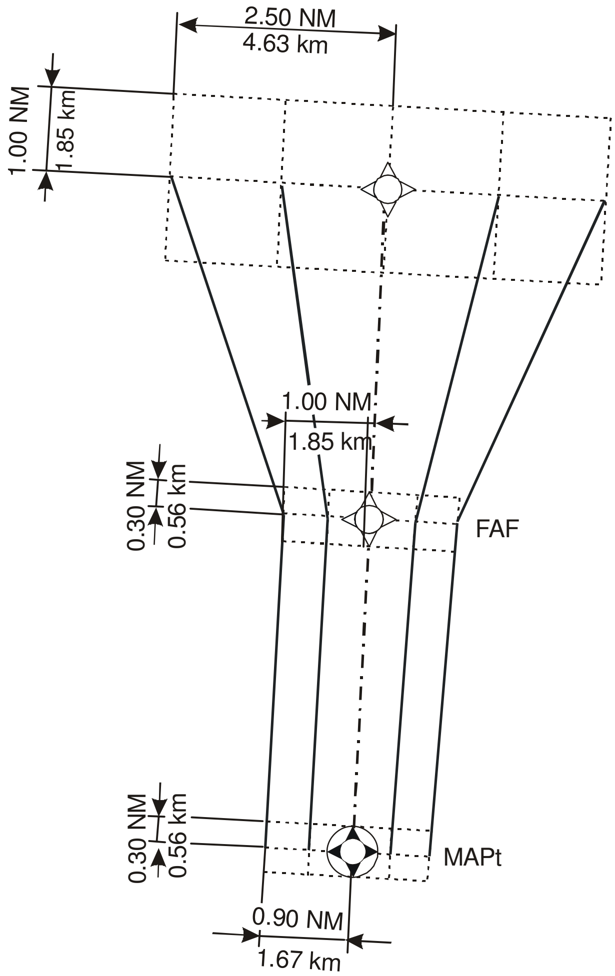


Figure IV-1-3. Intermediate and final segments

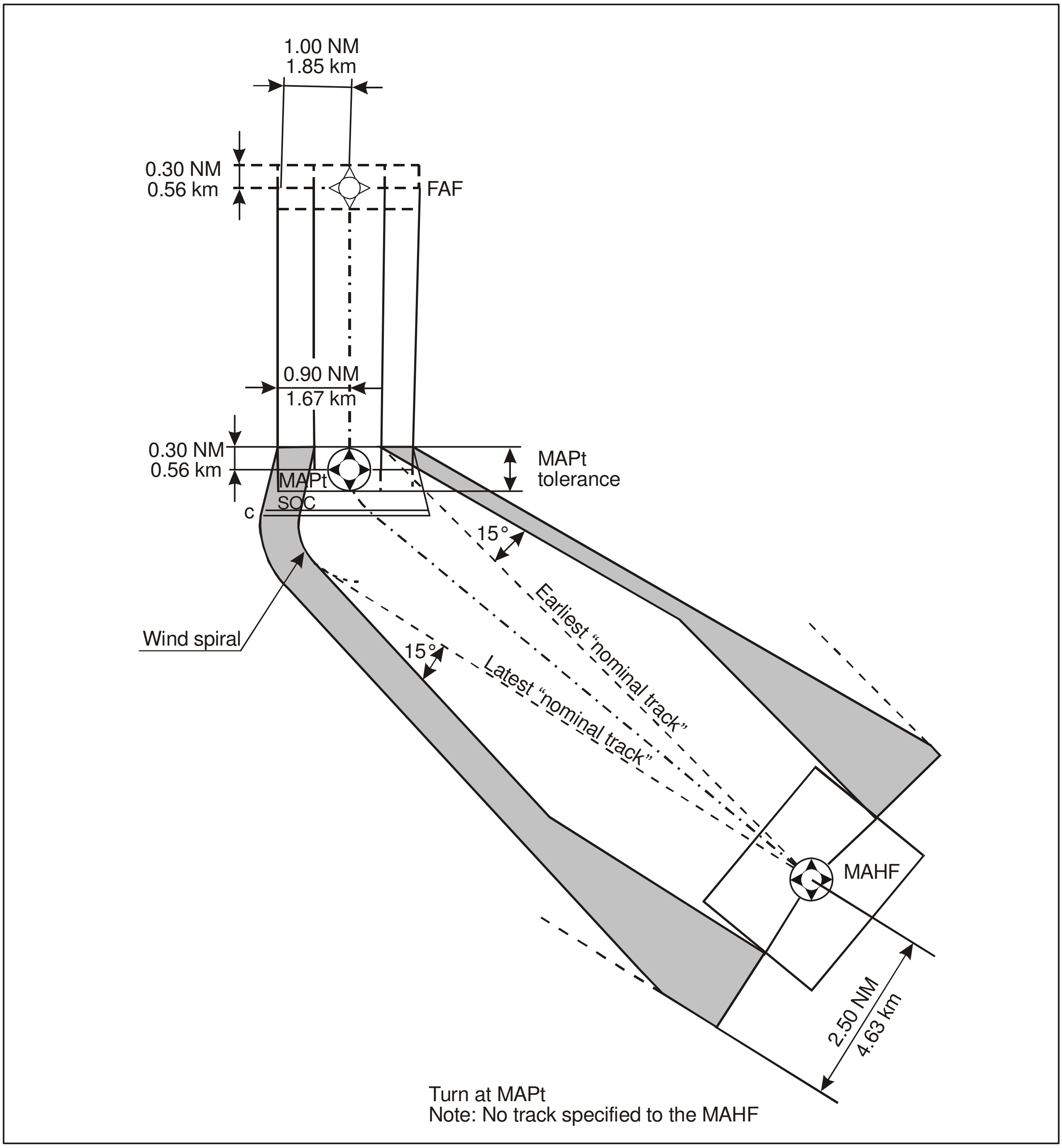


Figure IV-1-4. Turning missed approach

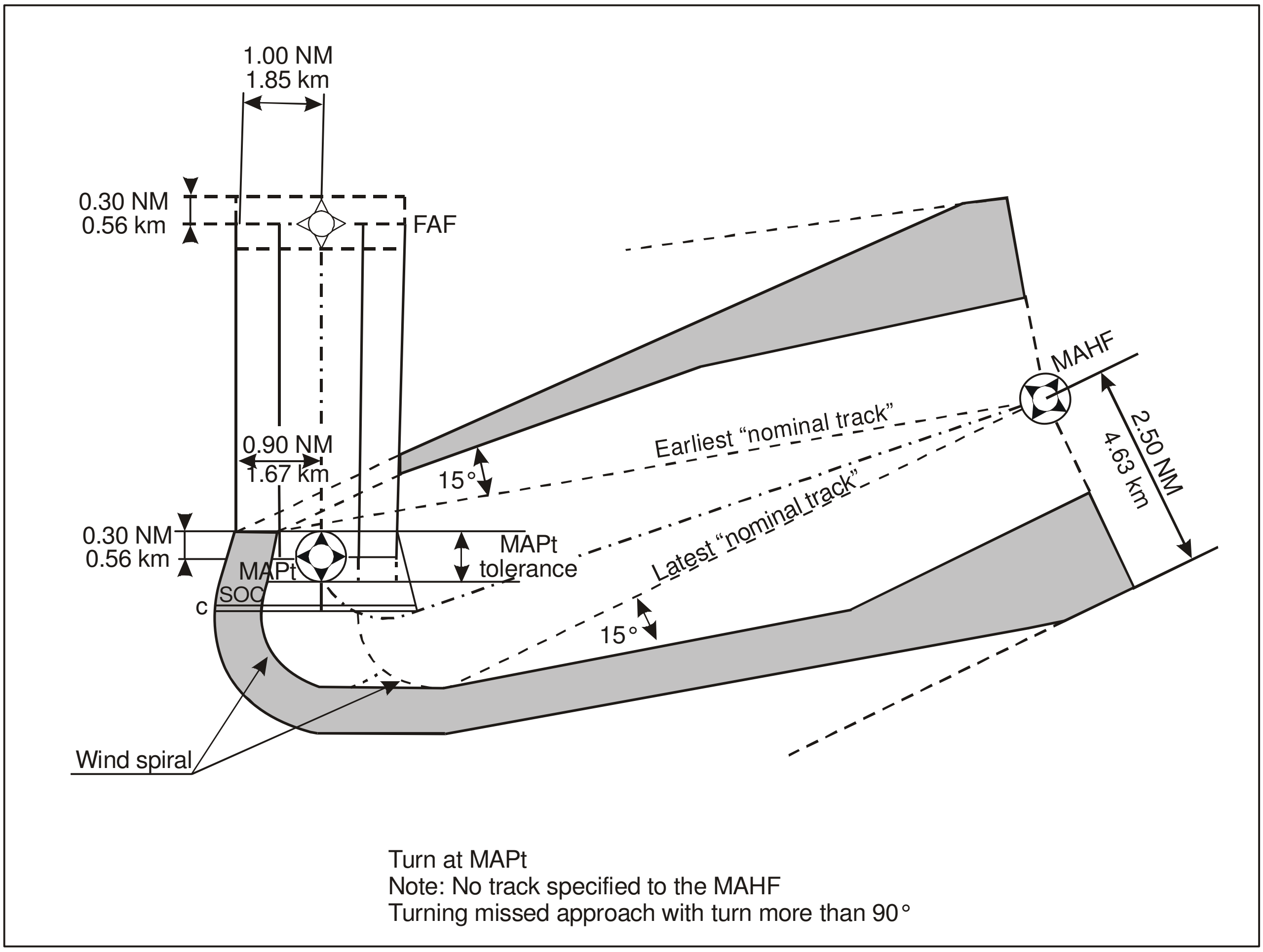


Figure IV-1-5. Turning missed approach with turn more than 90°

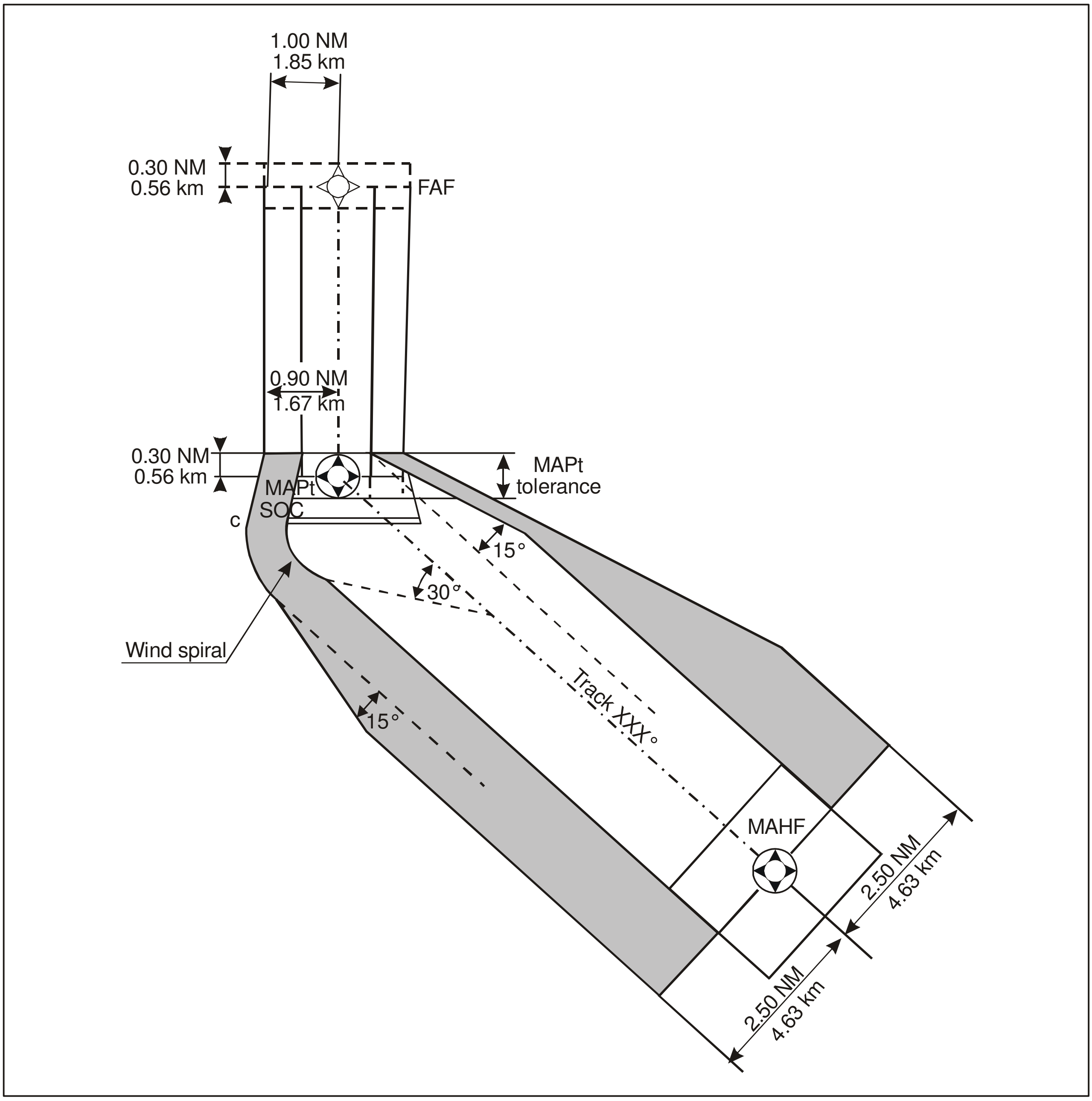


Figure IV-1-6. Turning missed approach with turn less than or equal to 90°

— END —

ICAO TECHNICAL PUBLICATIONS

The following summary gives the status, and also describes in general terms the contents of the various series of technical publications issued by the International Civil Aviation Organization. It does not include specialized publications that do not fall specifically within one of the series, such as the Aeronautical Chart Catalogue or the Meteorological Tables for International Air Navigation.

International Standards and Recommended Practices are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications contained in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

Procedures for Air Navigation Services (PANS) are approved by the Council for worldwide application. They contain, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome.

Regional Supplementary Procedures (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

The following publications are prepared by authority of the Secretary General in accordance with the principles and policies approved by the Council.

Technical Manuals provide guidance and information in amplification of the International Standards, Recommended Practices and PANS, the implementation of which they are designed to facilitate.

Air Navigation Plans detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

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