



# HOLDING PROCEDURES

## 1. Introduction

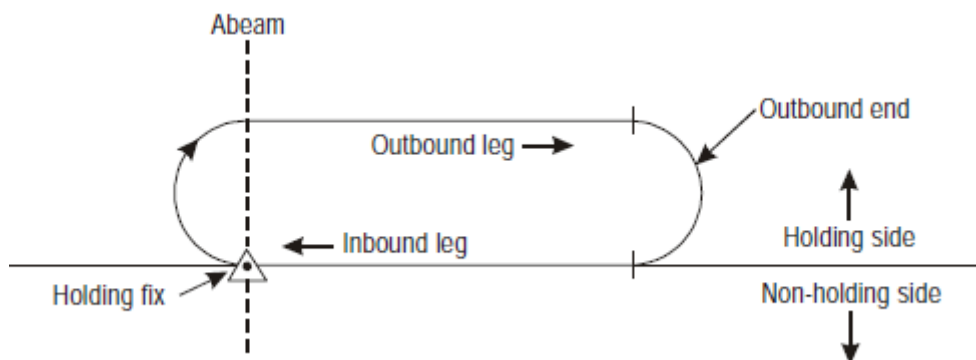
A holding procedure is a predetermined manoeuvre which keeps an aircraft under instrument flight rules (IFR) within a specified airspace while awaiting further clearance.

The holding procedure has a holding fix which is a geographical location that serves as a reference.

The procedures described in this document are related to right turn holding patterns. For left turn holding patterns, the corresponding entry and holding procedures are symmetrical with respect to the inbound holding track.

## 2. Shape of holding pattern and holding performance

The shape and terminology associated with the holding pattern are given in the figure below.



A normal holding pattern has by order:

- **A reference fix:** it is the holding pattern start. It can be a navigation aid, DME distance and track from a navigation aid or a normal FIX. It is mandatory to overfly this fix for an aircraft to enter a holding pattern.
- **A first half turn (180°)** to the right (it can be left hand if published) to join the outbound leg
- **An outbound leg** which usually starts abeam the holding fix at a published heading and ends after a certain period of time or certain DME distance described on the charts
- **A second half turn (180°)** to the right to join the inbound leg
- **An inbound leg** to join the holding fix at a certain predefined track

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## 2.1. Default parameters

By default, if a holding pattern is not published, the standard holding pattern is defined with right turns and the outbound leg is 1 minute.

The flying time of an outbound leg should not exceed:

- 1 minute if at or below 14000ft or 4250m
- 1 minute + 30 seconds if above 14000ft or 4250m

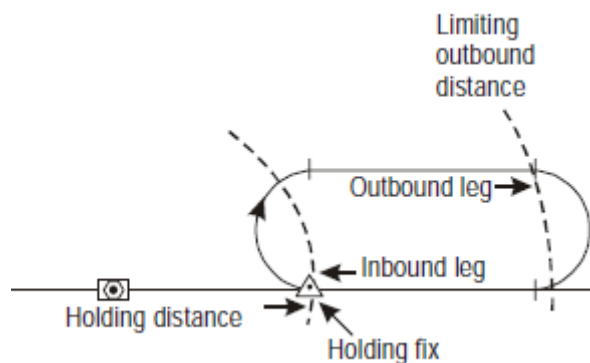
## 2.2. Turns

All turns are to be made at a bank angle of 25° or at a rate of 3° per second, whichever requires the lesser bank

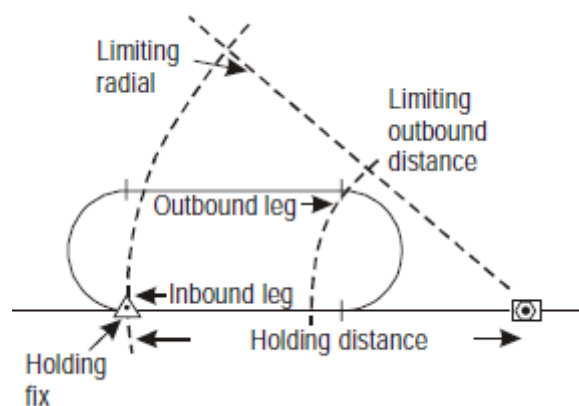
## 2.3. Outbound parameters

Outbound timing begins over or abeam the fix, whichever occurs later. If the abeam position cannot be determined, the pilot shall start timing when the turn to outbound is completed.

If the outbound leg length is based on a DME distance, then the outbound leg terminates as soon as the limiting DME distance is reached.



In the case of holding away from the station, where the distance from the holding fix to the VOR/DME station is short, a limiting radial may be specified. This limiting radial may be specified where airspace conservation/protection is essential.



If the limiting radial is reached before the limiting DME distance, this radial should be followed until a true inbound is initiated.

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## 2.4. Winds correction

Pilots should attempt to maintain the track by making allowance for known wind by applying correction both to heading and timing.

## 2.5. Speed Restrictions

Holding patterns shall be entered and flown at or below the airspeed given in the table below.

Altitude (or levels)	Under normal conditions	Under turbulence conditions
A < 14000ft A < 4250m	IAS = 230KT or 425km/h	IAS = 280KT or 315 km/h
14000ft < A < 20000ft 4250m < A < 6100m	IAS = 240KT or 445 km/h	IAS = 280KT or 520 km/h or 0.80 Mach whichever is less
20000ft < A < 34000ft 6100m < A < 10350m	IAS = 265KT or 490 km/h	IAS = 280KT or 520 km/h or 0.80 Mach whichever is less
A > 34000ft A > 10350m	IAS = 0.83 Mach	IAS = 0.83 Mach

The levels shown represent altitudes or corresponding flight levels depending upon the altimeter setting in use.

The speed of 280KT or 520km/h reserved for turbulence conditions shall be used for holding only after prior clearance with ATC unless this speed is published.

Whenever possible, 280KT or 520km/h should be used for holding procedures associated with airway route structures.

For holdings limited to category B and A, please use this table:

Altitude (or levels)	Under normal conditions	Under turbulence conditions
A < 14000ft A < 4250m	IAS = 170KT or 315km/h	IAS = 170KT or 315km/h

For helicopters, please use this table:

Altitude (or levels)	Speed
A < 6000ft A < 1830m	IAS = 100KT or 185km/h
A > 6000ft A > 1830m	IAS = 170KT or 315km/h

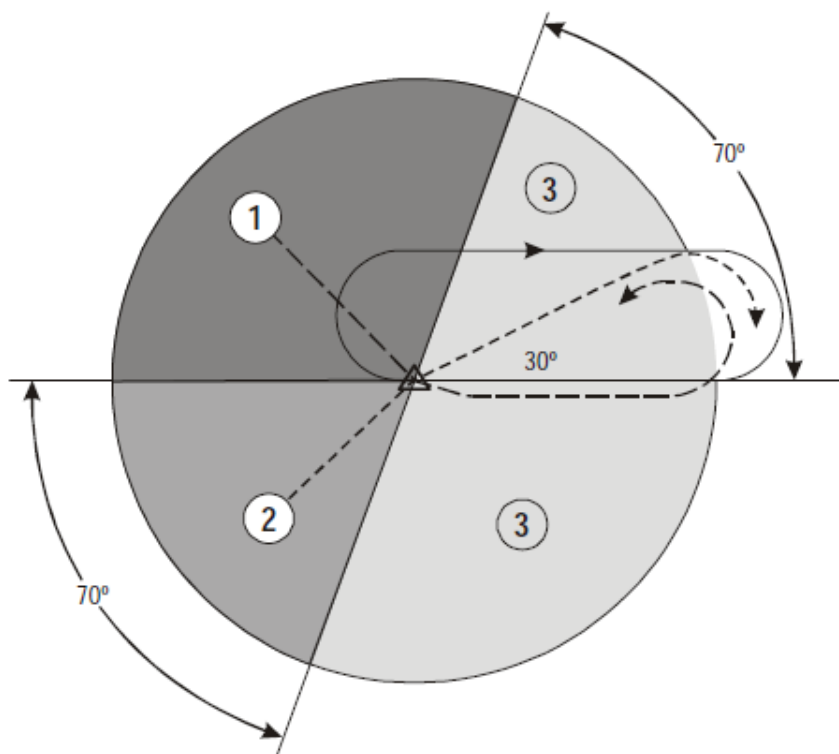
## 2.6. Use of RNAV system in holding pattern

Please read chapter 4 of this documentation in order to have all the necessary information.

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### 3. Holding pattern entries

The entry into the holding pattern shall be according to the heading in relation to the three entry sectors shown in the figure below. (Reference is inbound track and holding fix)



- Sector 1 entry is called **parallel** entry
- Sector 2 entry is called **offset** entry (or **teardrop** entry)
- Sector 3 entry is called **direct** entry

#### 3.1. General parameters

We recognize a zone of flexibility of 5° on either side of the sector boundaries.

For holding on a VOR intersection, the entry track is limited to the radials forming the intersection.

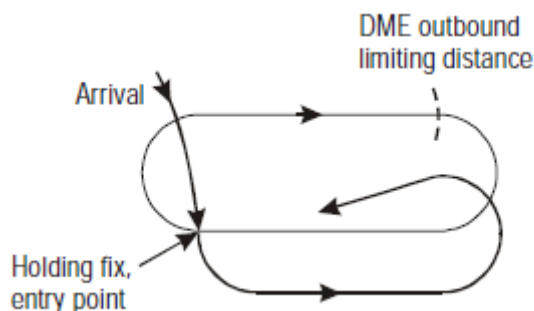
For holding on a VOR/DME fix, the entry track is limited to the VOR radial and the DME arc

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### 3.2. Sector 1 entry / parallel entry

The pilot shall respect the parallel entry procedure:

- Aircraft will join the holding and its heading is between
  - Inbound track  $+180^\circ$  or Inbound track  $-180^\circ$
  - Inbound track  $+290^\circ$  or Inbound track  $-70^\circ$
- At the fix, the aircraft is turned left onto an outbound heading for the appropriate period of time (maximum 1 minute or  $1+1/2$  minute if altitude is greater than 14000ft) or DME distance as published
- Thereafter, the aircraft is turned left onto the holding side to intercept the inbound track or to return to the fix
- On second arrival over the holding fix, the aircraft is turned right to follow the holding pattern

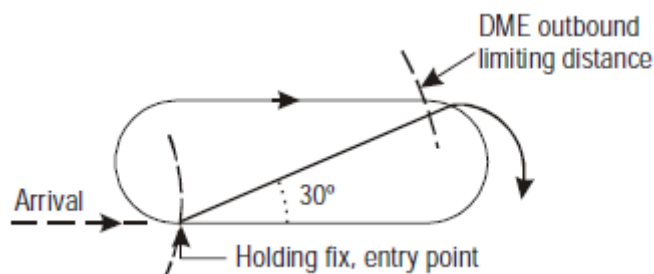


Example of parallel entry

### 3.3. Sector 2 entry / offset entry

The pilot shall respect the offset entry procedure:

- Aircraft will join the holding if its heading is between
  - Inbound track  $+110^\circ$  or Inbound track  $-250^\circ$
  - Inbound track  $+180^\circ$  or Inbound track  $-180^\circ$
- At the fix, the aircraft is turned left onto a heading to follow a track with making an angle of  $30^\circ$  from the reciprocal of the inbound track on the holding side (=inbound track  $+150^\circ$  or outbound track  $-30^\circ$ )
- Then, the aircraft will fly outbound maximum 1 minute (or  $1+1/2$  minute if altitude is greater than 14000ft) or until the appropriate limiting DME distance is reached (or limited radial if published).
- Then the aircraft is turned right to intercept the inbound holding track.
- On second arrival over the holding fix, the aircraft is turned right to follow the holding pattern



Example of offset entry

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### 3.4. Sector 3 / direct entry

The pilot shall respect the direct entry procedure:

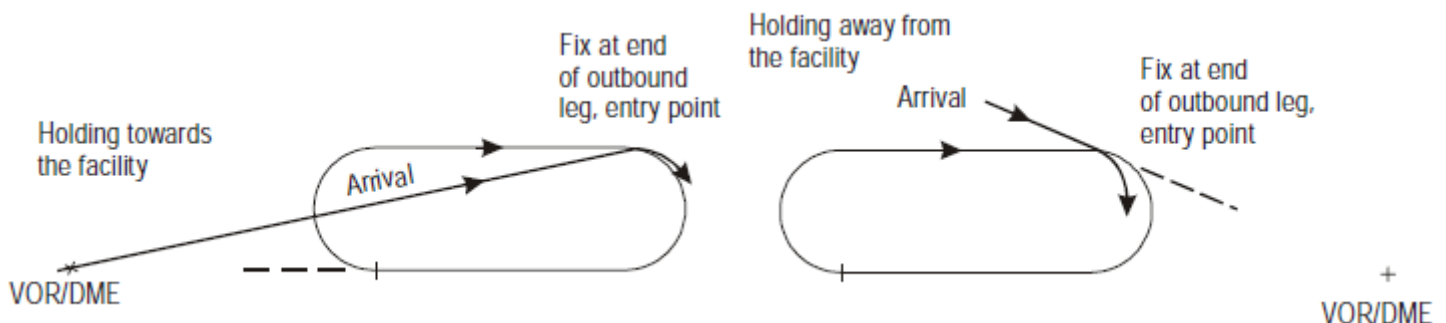
- Aircraft will join the holding if its heading is between
  - Inbound track  $+290^\circ$  or Inbound track  $-70^\circ$
  - Inbound track  $+110^\circ$  or Inbound track  $-250^\circ$
- At the fix, the aircraft initiates a  $180^\circ$  turn to the right
- Abeam the holding fix or at the end of the turn if abeam cannot be determined, aircraft will continue at outbound track maximum 1 minute (or  $1+1/2$  minute if altitude is greater than 14000ft) or until the appropriate limiting DME distance is reached (or limited radial if published).
- Then the aircraft is turned right to intercept the inbound holding track.
- On second arrival over the holding fix, the aircraft is turned right to follow the holding pattern

### 3.5. Specific entry / DME arc entry

At the fix, from a DME arc, the aircraft shall enter the holding pattern in accordance with either the sector 1 or sector 3 entry procedures.

### 3.6. Specific entry / Non standard

For holding on a VOR/DME fix, the entry shall be located using a radial at the end of the outbound leg as published.



In real aviation other non-standard entries exist. In this version of the document, we currently do not describe those.

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## 4. RNAV holding

RNAV holding functionality varies across different RNAV systems:

- Simpler RNAV systems provide only a capability to follow a course to a waypoint
- Other systems calculate the size of the holding pattern to be flown based on ICAO speed constraints and taking into account current TAS, wind conditions

The constraints and parameters, presented in chapter 2 of this documentation, are applied except parameters modified by the material of this chapter.

Pilots shall ensure that speeds used to fly the RNAV holding procedures comply with the tables presented in chapter 2.5 of this document..

When RNAV equipment is used for non-RNAV holding procedures, the pilot shall verify the positional accuracy at the holding fix on each passage of the fix.

### 4.1. Aircraft equipped with RNAV system WITH holding functionality

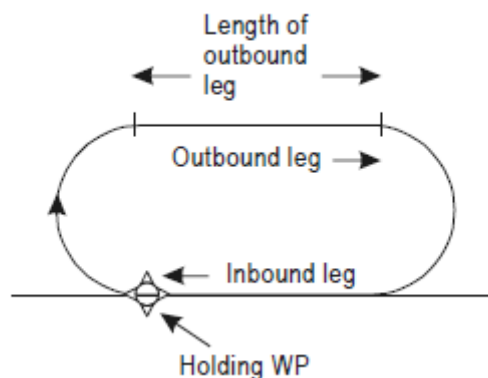
In this RNAV system, holding waypoints and supporting data contained in the navigation database are calculated and promulgated by the authority (Aircac).

Holding waypoints may also be input by the operator or flight crew in flight management system.

The pilot should cross-check the waypoint position using VOR/DME fix information where this is available

To use this RNAV operation, the aircraft shall be fitted by serviceable RNAV equipment and the pilot has a current knowledge of how to operate the equipment to optimize navigation accuracy.

For RNAV holding patterns coded and flown by the aircraft navigation system, the outbound leg is defined by calculated length based on TAS, wind conditions and ICAO speed restrictions.



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## 4.2. Aircraft equipped with RNAV system WITHOUT holding functionality

For aircraft equipped with RNAV systems without any holding functionality, it is possible to fly a published RNAV holding procedure overhead a waypoint manually.

In this RNAV system, the holding waypoint is retrieved in the navigation database or input by the flight crew into the flight management system.

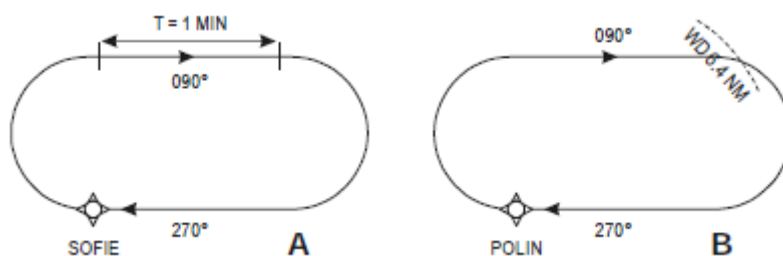
The pilot should cross-check the waypoint position using VOR/DME fix information where this is available

The pilot shall fly the holding manually by at least:

- Changing automatic sequencing of waypoint to manual
- Designating the holding waypoint as active (Direct to)
- Selecting the desired inbound course to the designated holding waypoint (keypad entry, HSI, CDU)

This type of holding will be flown manually and RNAV track guidance is provided only on the inbound track.

The end of the outbound leg of the holding is defined by timing or by a distance from the holding waypoint (WD) provided by the RNAV system.



The outbound timing leg begins when the turn to outbound is completed or abeam the waypoint, whichever occurs later.

When the end of the outbound leg is defined by an RNAV distance from the holding waypoint (WD), the outbound leg is terminated as soon as the distance is reached.

Conventional holding patterns may be flown with the assistance of a RNAV system which has no other function than to provide guidance for the autopilot of flight director.  
The pilot remains responsible for ensuring that the aircraft complies with the speed, bank angle, timing and distance presented in chapter 2 of this document..

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### 4.3. RNAV holding entries

Except where specific entry is published, entries into a RNAV holding pattern are the same as for conventional holdings based on NDB, VOR and/or DME presented in chapter 3 of this document..

Alternative RNAV entries which are less space consuming are today being studied by ICAO. No operational date has been decided for their implementation.

## 5. ATC holding clearance

The air traffic controller shall give a holding clearance to an aircraft even if this procedure is not published.

If for any reason a pilot is unable to conform to the procedures for normal conditions, the air traffic controller should be advised as early as possible.

In case of a published holding, the air traffic controller shall indicate to the pilot to hold at the holding point. The pilot must have the charts on board, especially the arrival and approach charts.

In case of a non-published holding, the air traffic controller shall give to the pilot the following elements:

- Holding point which can be a fix or radio navigation aid (mandatory)
- Inbound track in degrees (by default if the value has not been given, the pilot will take the arriving heading at the holding point as the inbound track)
- Right turn or left turn holding pattern (by default, when information has not been given, pilot shall use right turn)
- Outbound time or outbound DME distance from an DME navigation aid (by default, when information has not been given, the pilot shall use 1 minute outbound time)
- Altitude (or flight level) of the track (by default, when information has not been given, the pilot will follow the last altitude clearance)
- IAS speed when necessary
- Departure time from the holding point when necessary

When clearance is received specifying the time of departure from the holding point, the pilot should adjust the pattern within the limits of the established holding procedure in order to leave the holding point at the time specified.

Be aware that a pilot shall start a holding procedure on the last cleared point if he has not received any amended clearance to continue on another track.

For example, at the end of STAR arrival procedure at the IAF, if the **pilot has not received an approach clearance**, he shall not continue on the approach track and shall start a holding procedure over the IAF without any holding request received.

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