

Holding Patterns - Ground Lesson

Attention

Air Traffic control says "N123AB hold on the 270 radial of the Rome VOR RMG". Or you are flying the KRMG ILS 1 approach which includes a hold at GPS intersection KAREL.

Objective

To gain knowledge of all the elements of holding patterns and then be able to fly a proper holding pattern.

Schedule

Ground instruction – 60 minutes

Air instruction – 60 minutes

Reference Material

Instrument Flying Handbook FAA-H-8083-15B (2012)
14 CFR 91.185

What

A hold is an IFR maneuver used to keep an airplane in a specific, protected area for a certain amount of time. Aircraft do not have the ability to pull over (like a car) a hold is used to wait in the air.

Why

There are various reasons an aircraft may be requested to hold, including congestion at the destination airport, weather, runway closures, another aircraft on the IFR approach into an uncontrolled airport, etc. It makes sense to enter a holding pattern on an approach even when not instructed by ATC, even in VFR conditions. If you were flying westward at 9500 feet but you need to get down to 3000 feet, you will need time to do so.

Elements

How to enter the hold.

Standard holding pattern vs non-standard holding pattern.

Which radial/direction you plan on holding on.

The amount of time in minutes or miles you will hold.

Material

Student will be told by ATC or instructor:

Direction of holding from the fix in terms of the 8 cardinal compass points.

The holding fix which is typically a VOR or GPS intersection.

The radial, course, bearing, airway, or route on which the aircraft is to hold.

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The amount of miles or minutes to hold.
Right or left turns. If not specified use right turns.

If you are at the Fix you would turn to a heading that matches the outbound leg. You will fly for the specified time or distance and then turn 180 degrees to the inbound leg heading. Normally you will go once around the 'race track'.

Figure 1 shows a holding pattern using:
Direction = East and Turns = Right

Therefore the outbound leg will be east (090) and the inbound side will be west (270).

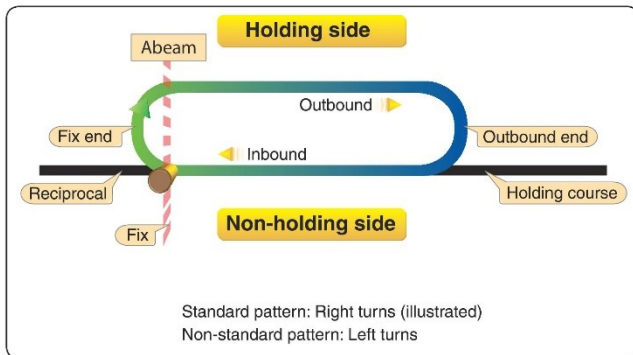


Figure 1 Holding pattern components

Be aware the outbound and inbound legs are using ground tracks. You always need to take in consideration the winds. Figure 2 shows a plane turning its nose toward the wind to keep on track.

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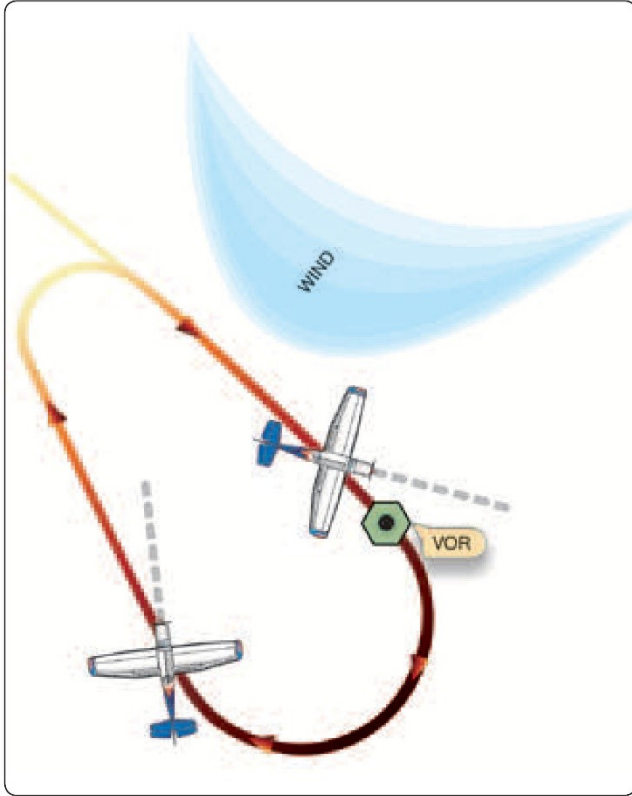


Figure 2 Wind correction

Most people including myself can easily fly a holding pattern. It is actually the simplest flying you can do other than a long straight en route leg. The confusion to most people, including me, is always how you enter the 'race track'. Figure 3 shows the three entry patterns known as Direct, Teardrop, and Parallel. So how do we determine which entry we use? It all depends on where you are coming from...your heading into the fix.

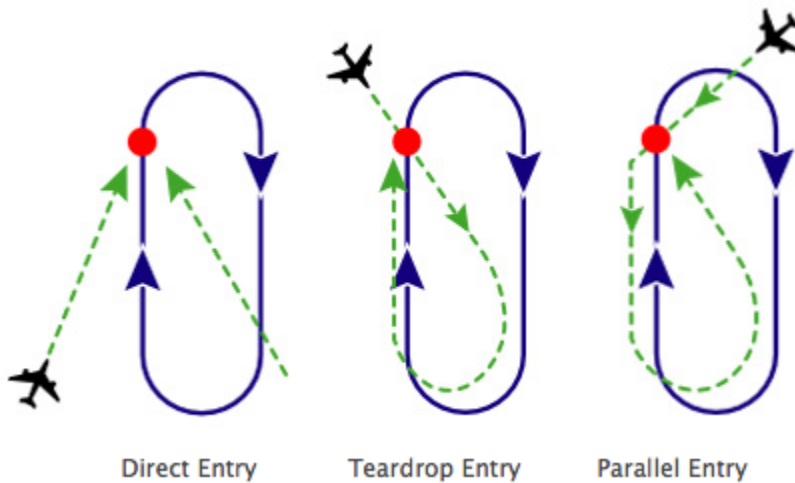


Figure 3 Entry types

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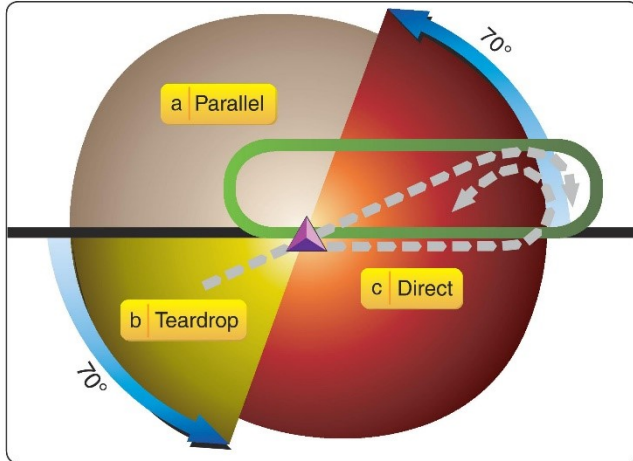


Figure 4 How to determine which entry type

Figures 4 and 5 will help you determine which entry you would choose on a right turn, standard holding pattern. Figure 4 has you holding east (090) and Figure 5 has you holding north (000/360).

Let's look at Figure 5 which shows how you can quickly figure out using a standard hold on due north (000/360). Once this makes sense it becomes simple math.

- 000 – 110 Direct
- 110 – 180 Teardrop
- 180 – 290 Parallel
- 290 – 360 Direct

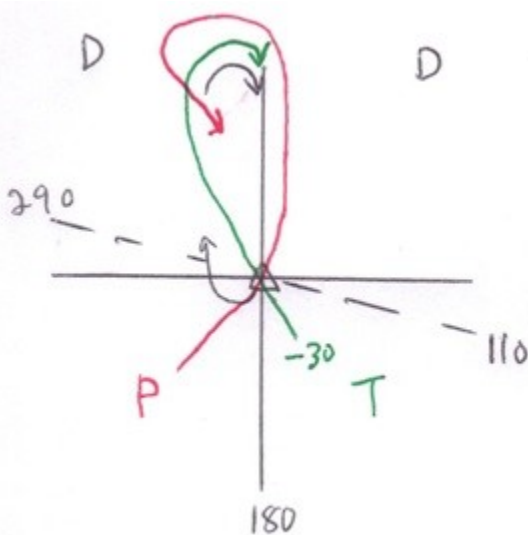


Figure 5 Standard Holding Pattern

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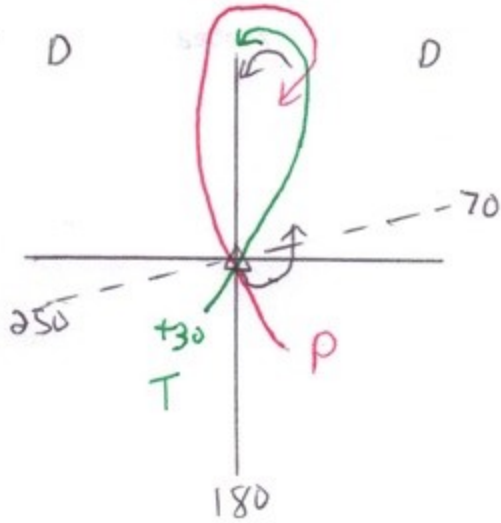


Figure 6 Non Standard Holding Pattern

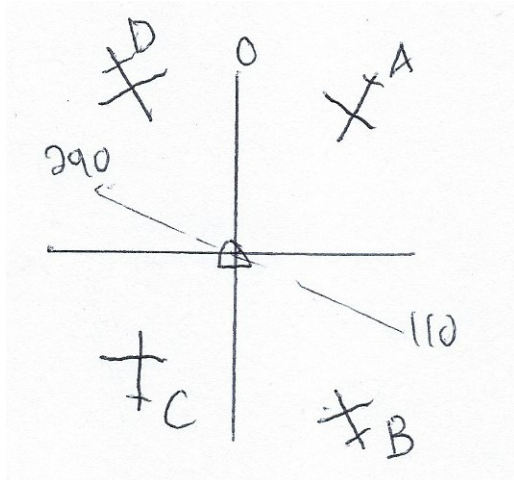


Figure 7

In Figure 7 you can see that plane A will use direct, plane B will use teardrop, plane C will use parallel, and plane D will use direct.

You say ok I understand now but the controller said hold east and I am northwest of the fix...huh which entry do I used? All I do is add...

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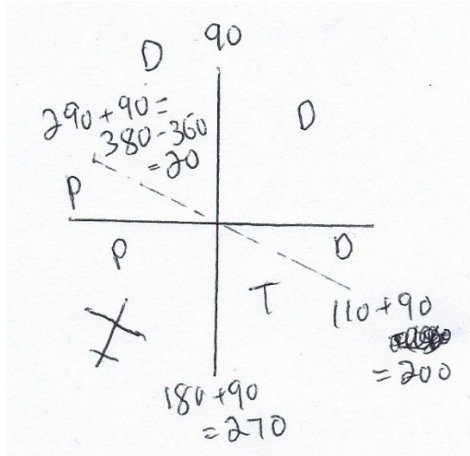


Figure 8

So if you are northwest of the fix, you would do a parallel entry. So if you were on a 300 radial of the VOR or a 300 'radial' of a GPS intersection, you would know how to enter using just addition and subtraction.

When I am flying in the clouds I can't even think what radial/'radial' I am on...do you have a quick way? Yes, if you are headed direct to a fix, just look at your heading and add 180/subtract 180. If the heading is 30, you are on the 210. If your heading is 300, you are on the 120.

You can also see if this helps:

<https://cbpowell.wordpress.com/2011/01/17/foolproof-and-fast-holding-pattern-entries/>

Speed Limits

There are speed limits. Maximum holding speeds are established to keep aircraft within the protected holding area during their one-minute (one-minute and a half above 14,000 ft MSL) inbound and outbound legs. For civil aircraft (not military) in the United States, these airspeeds are:

Up to 6,000 ft MSL: 200 KIAS
From 6,001 to 14,000 ft MSL: 230 KIAS
14,001 ft MSL and above: 265 KIAS

Lost Communications

From 91.185 (c)

(3) Leave clearance limit.

(i) When the clearance limit is a fix from which an approach begins, commence descent or descent and approach as close as possible to the expect-further-clearance (EFC) time if one has been received, or if one has not been received, as close as possible to the estimated time of arrival as calculated from the filed or amended (with ATC) estimated time en route.

(ii) If the clearance limit is not a fix from which an approach begins, leave the clearance limit at the expect-further-clearance (EFC) time if one has been received, or if none has been received,

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upon arrival over the clearance limit, and proceed to a fix from which an approach begins and commence descent or descent and approach as close as possible to the estimated time of arrival as calculated from the filed or amended (with ATC) estimated time en route.

Therefore...

If the clearance limit is an IAF, leave as close as possible to the EFC time, if one has been issued. If one has not been issued, leave as close as possible to the ETA calculated on the flight plan.

If the clearance limit is not an IAF, leave the fix as close as possible to the EFC time if one has been issued. If there was no EFC time to leave, depart the fix to where an approach begins and begin descent/approach as close as possible to the ETA calculated on the flight plan.