Holding Patterns

Lesson Objective

To develop understanding of the elements of holding patterns and then be able to fly a proper holding pattern

What

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 holding pattern is used to wait in the air.

I have animals separated into different areas while some are allowed to free travel. I have to highly control some of the animals and keep them separated.

Why

Why

There are various reasons an aircraft may be requested to hold:

- Congestion at the destination airport
- Weather
- Runway closures
- Another aircraft on the IFR approach
- You are at 8000 feet but need to get to 3000 feet

Why Not

You should NOT do holding patterns when ATC does not expect you to. If they expect you to go straight in then request a hold to give yourself more time. They are responsible for you and would have to separate traffic from you.

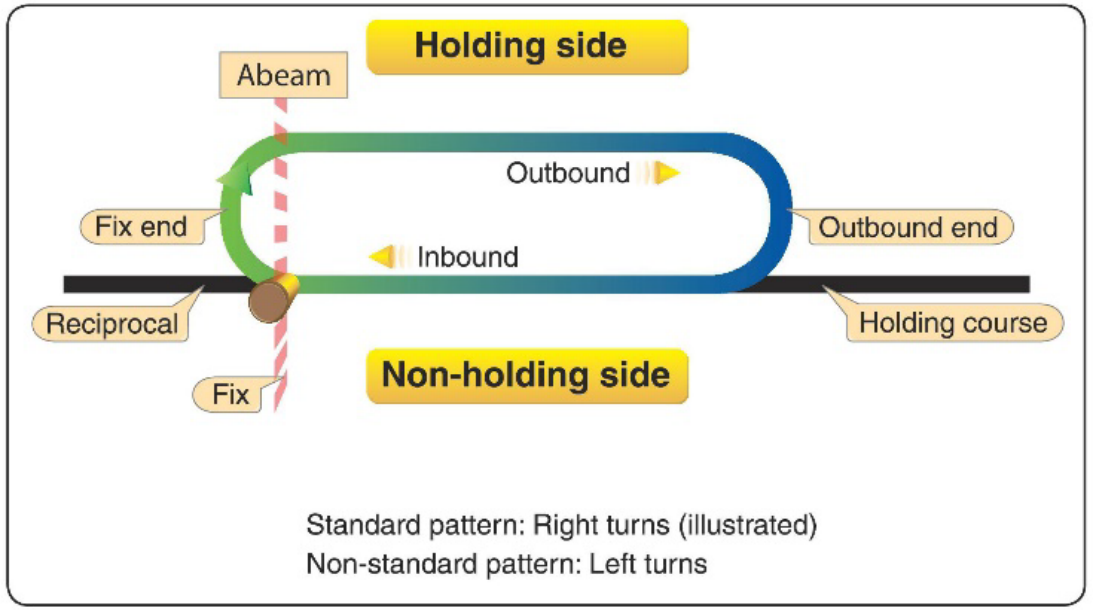
Holding pattern components

- The radial for the inbound leg
- The number of miles or minutes to hold
- Right or left turns

If not specified use right turns

The outbound leg is the reciprocal of the inbound leg

In some cases, you will go around the ‘race track’ once, while other times you are told to hold for 10 or 15 minutes

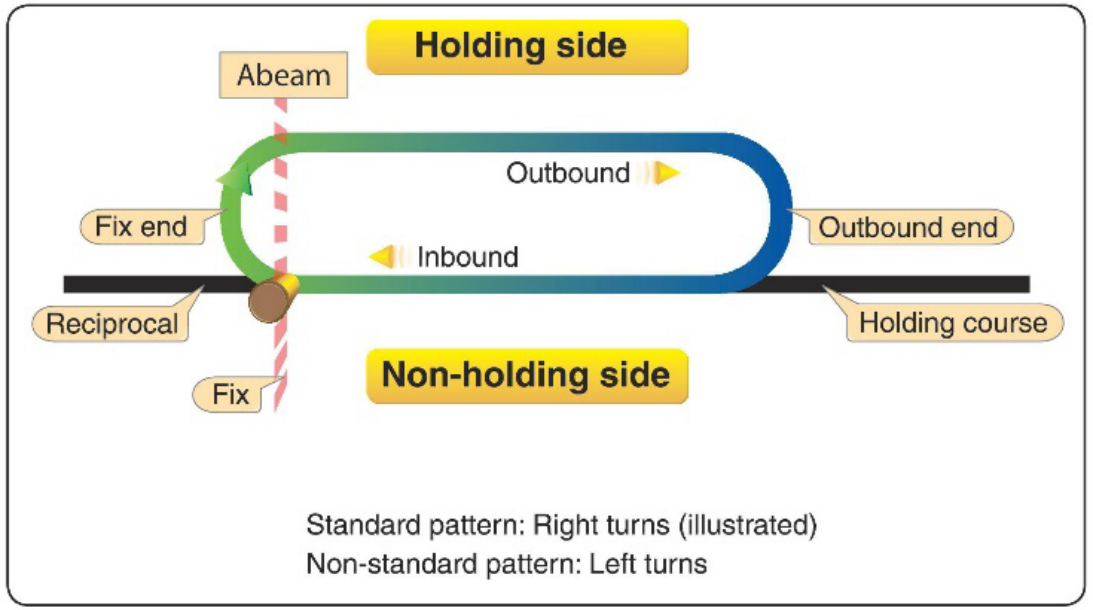


Holding pattern components

Shows a holding pattern holding East with standard turn

Inbound leg = 270

Outbound leg = 090

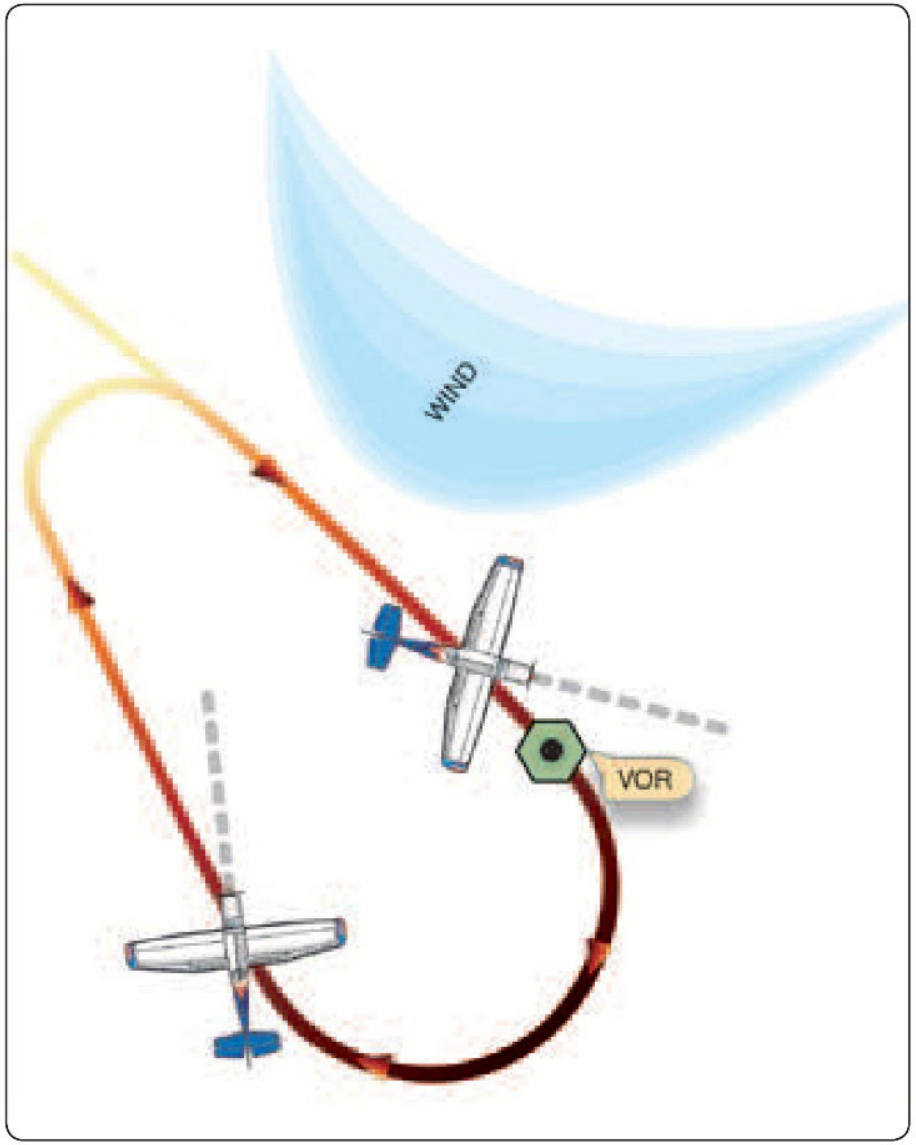


Wind correction

Be aware the outbound and inbound legs are using ground tracks.

You always need to take in consideration the winds.

This shows a plane turning its nose toward the wind to keep on track.

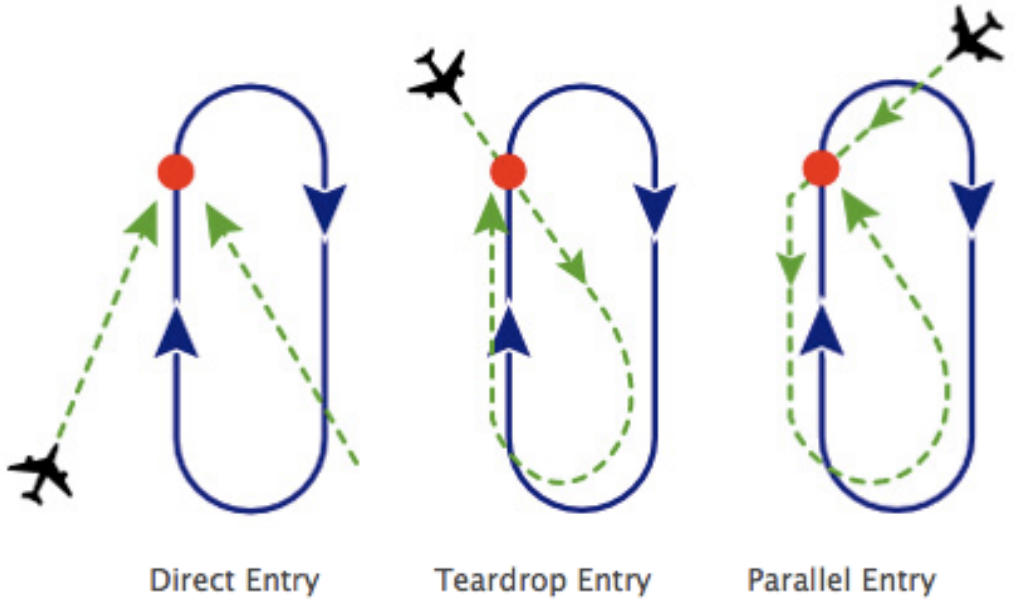


Entry types

Most people can easily fly a holding pattern.

The confusing part can be how you enter it.

Stay in the protected space.



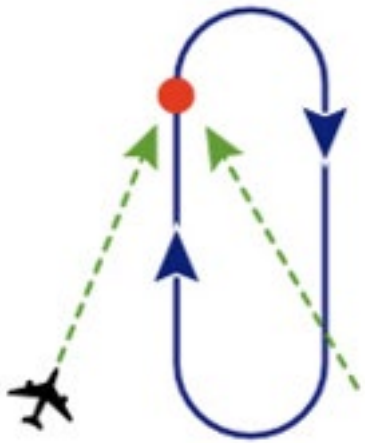
Direct

If you fly over the fix and turn around, it's Direct

Fly towards the VOR/fix

When you pass over it, turn to a heading that matches the outbound leg which will be offset from the inbound leg

Turn to the inbound leg after the specified time/distance



Direct Entry

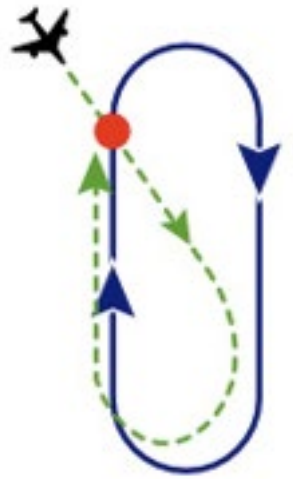
Teardrop

If you fly over the fix into the protected space, it’s a Teardrop

Fly towards the VOR/fix

Fly roughly 30 degrees off the radial you were told to hold on

Turn to the inbound leg after the specified time/distance



Teardrop Entry

Parallel

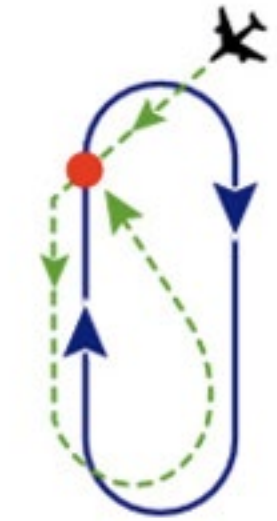
If you fly over the fix and need to fly on the radial to keep inside the protected space, it's Parallel

Fly towards the VOR/fix

When you pass over it, turn to a heading that matches the outbound leg which will be OVER the inbound leg

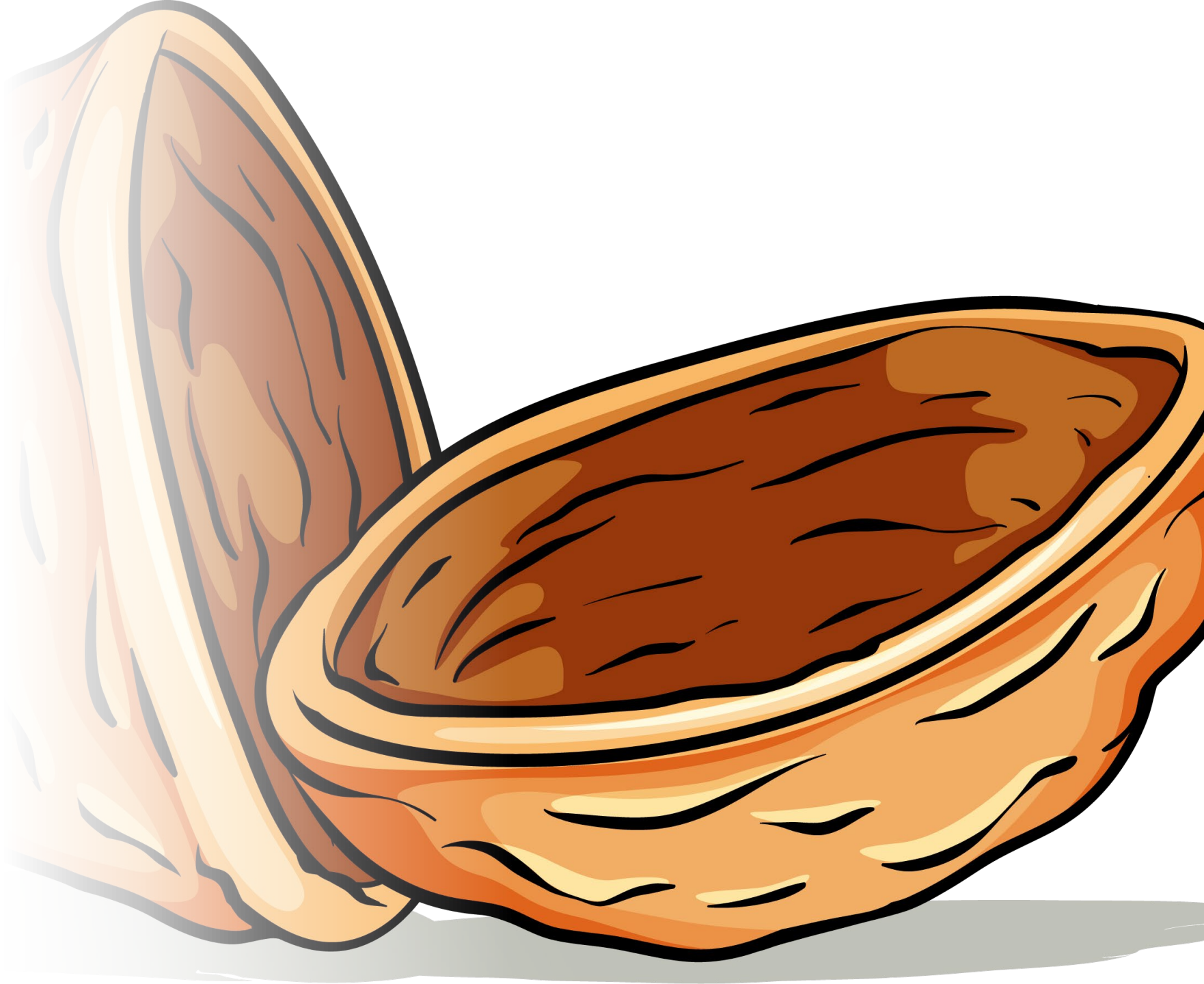
Turn back toward the VOR/fix after the specified time/distance

Then if you are going to 'go around again' do so now as a direct entry



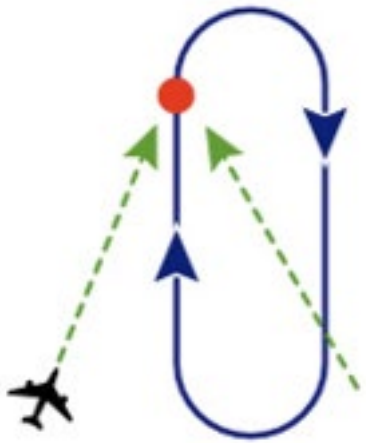
Parallel Entry

In a nutshell…



Direct

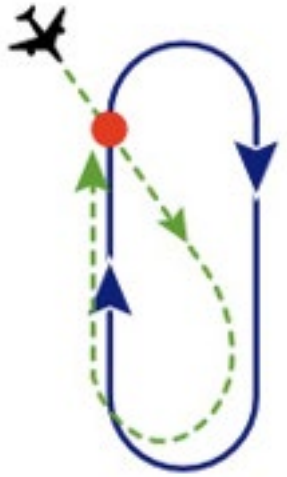
If you fly over the VOR/fix and need to turn back around…it is direct entry



Direct Entry

Teardrop

If you fly over the VOR/fix **into** the holding pattern protected space…it is a teardrop entry

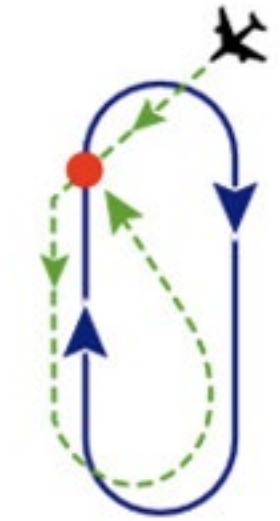


Teardrop Entry

Parallel

If you fly over the VOR/fix and you would end up outside of the protected space if you kept on that heading…it is a parallel entry

You do an opposite turn towards the VOR/fix

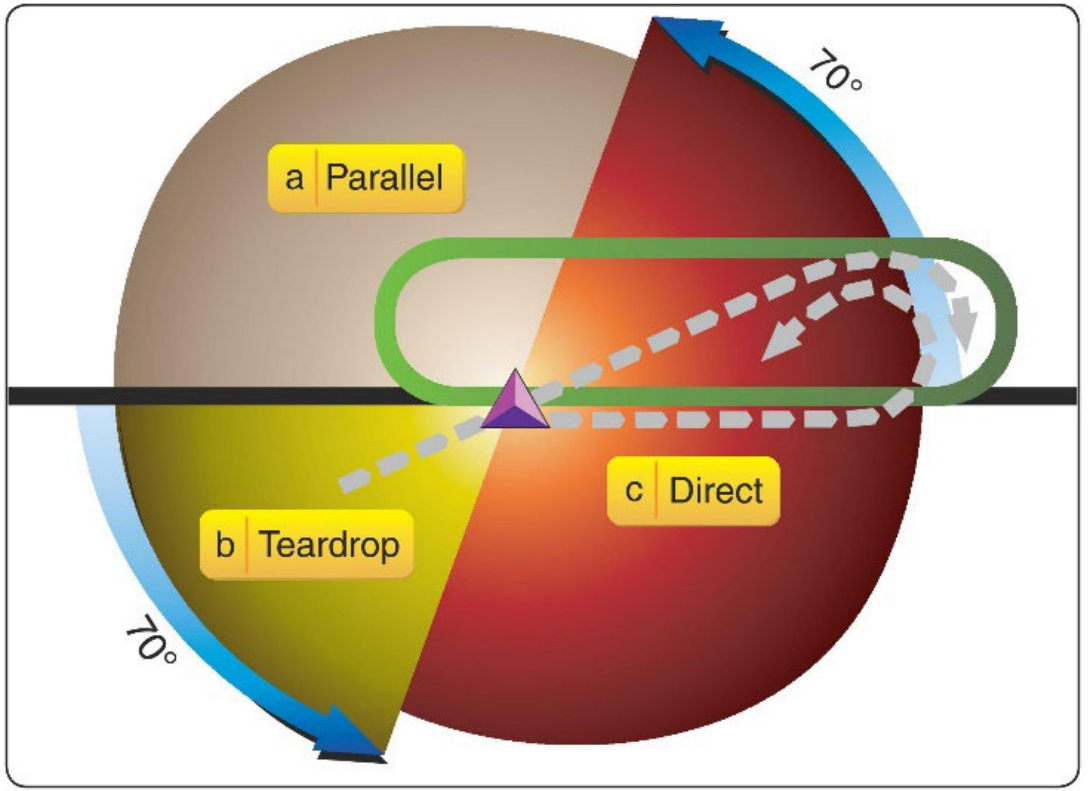


Parallel Entry

How to determine which entry type

To me this is just confusing

Most of the people I know that learned from these type of diagrams still don’t get it



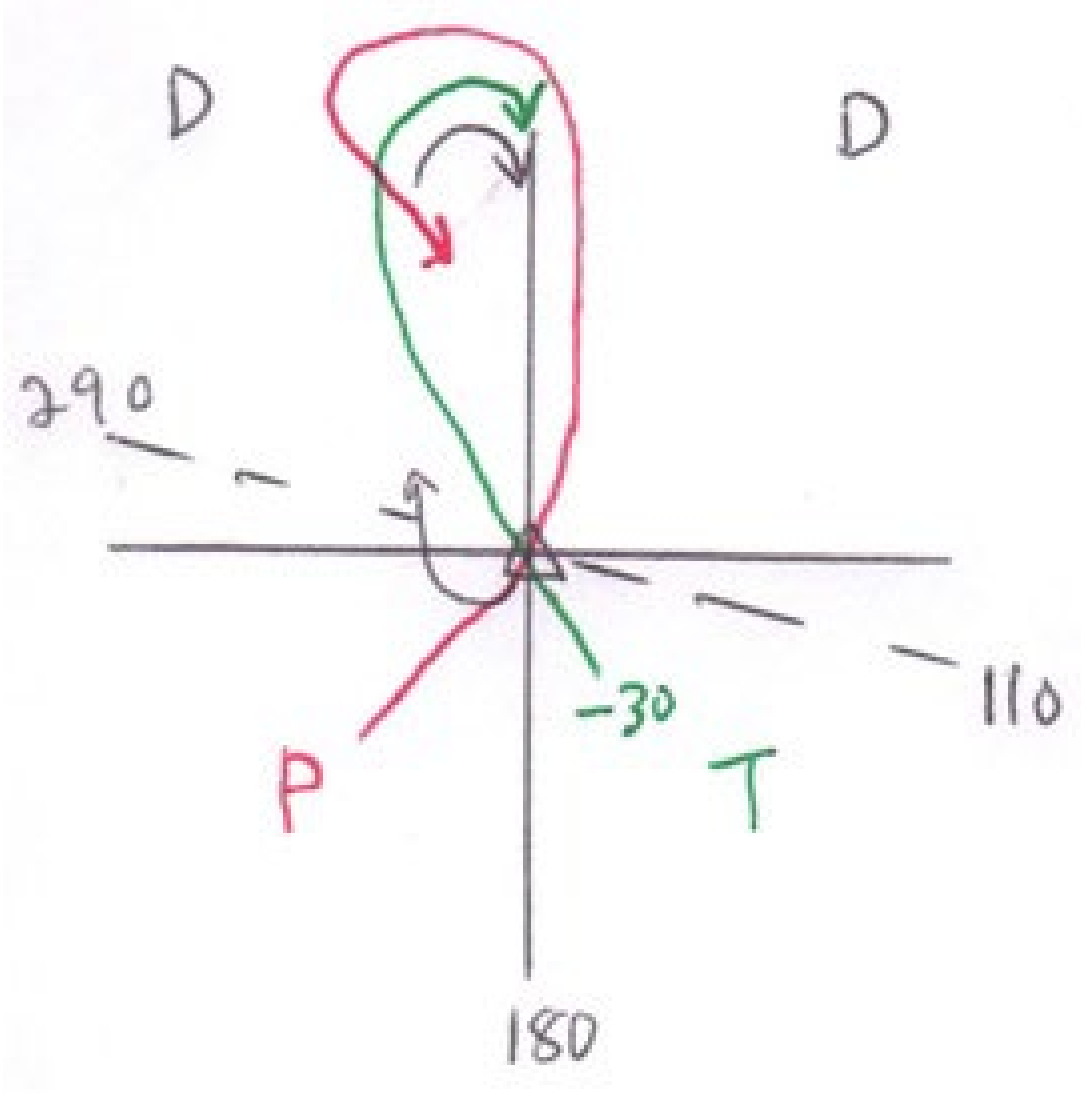
My Standard Holding Pattern Diagram (R)

000 – 110 Direct

110 – 180 Teardrop

180 – 290 Parallel

290 – 360 Direct



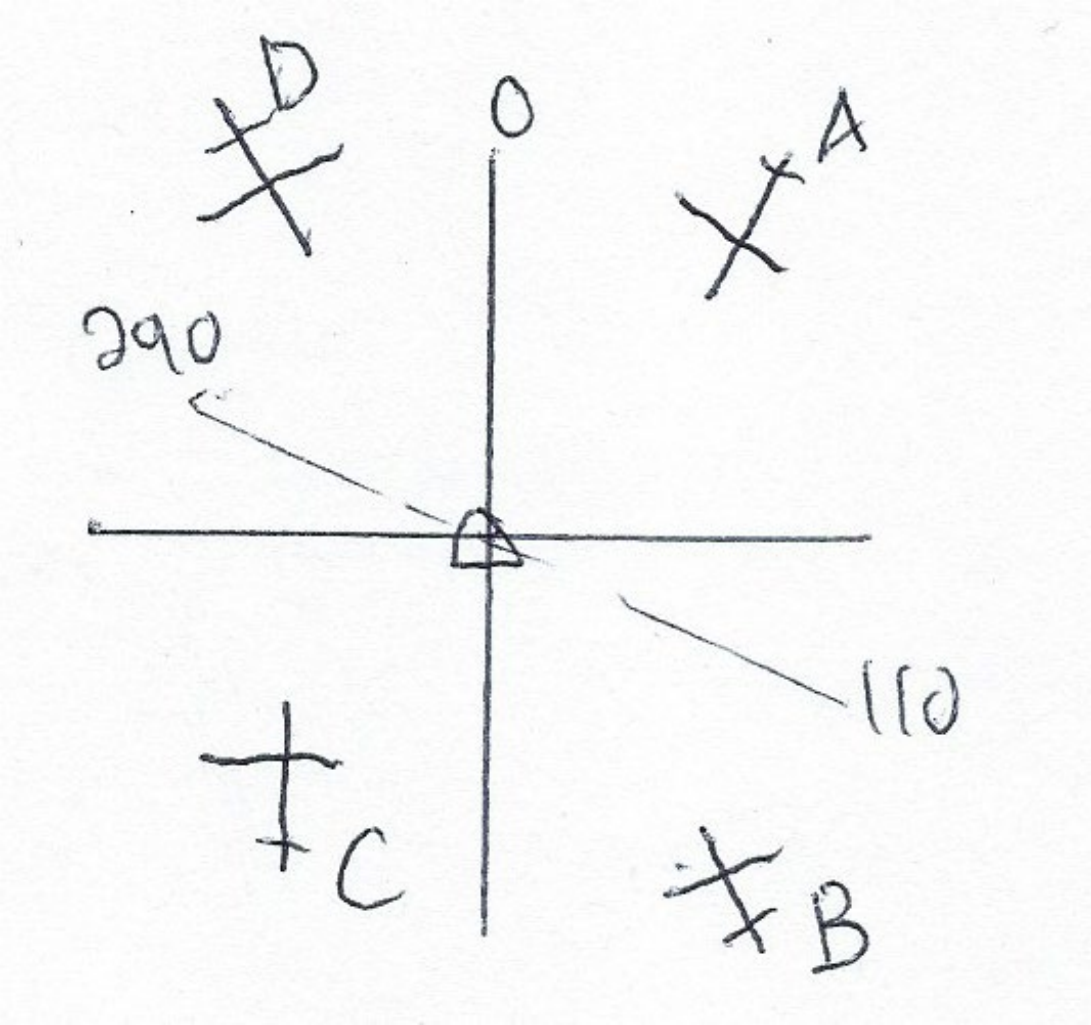
Sketch

A direct

B teardrop

C parallel

D direct



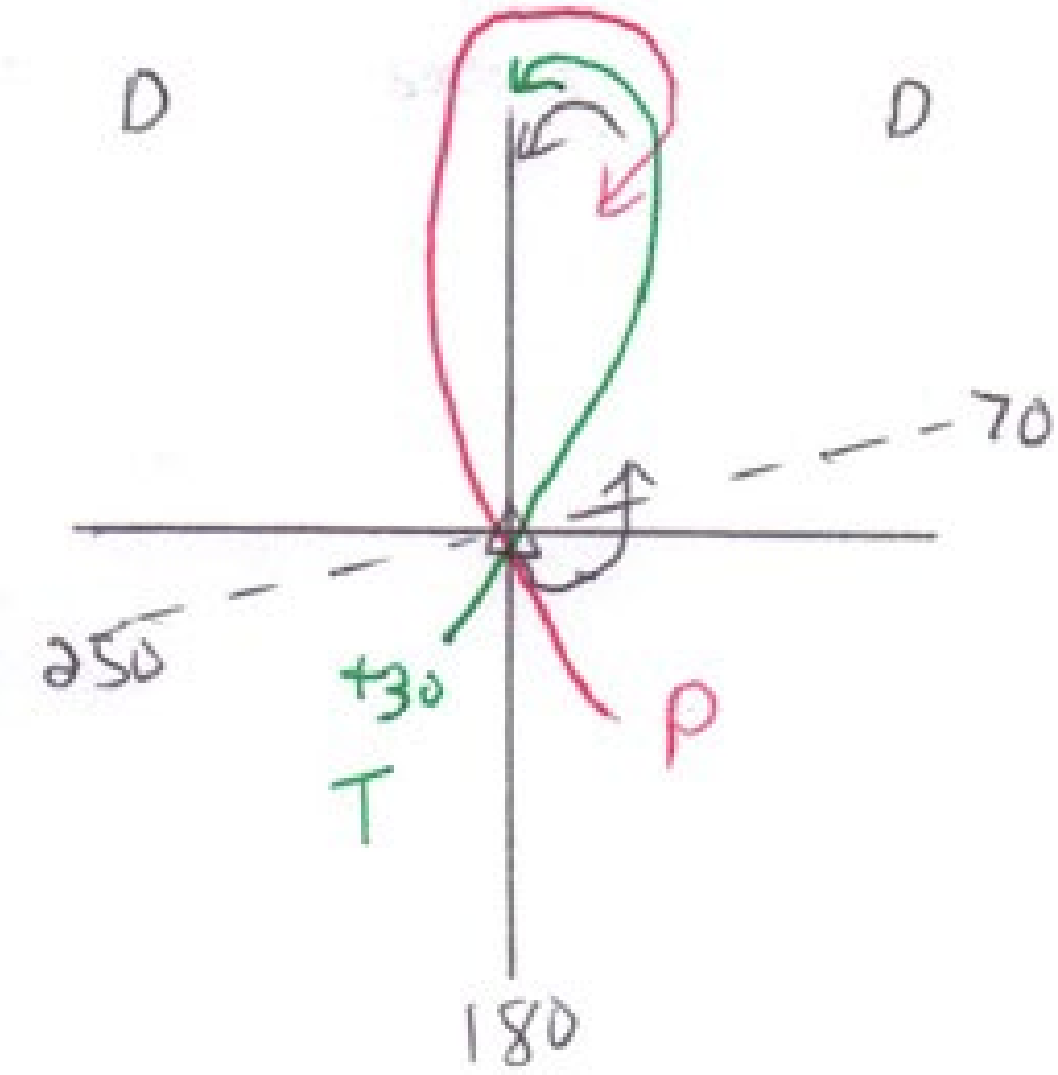
My Standard Holding Pattern Diagram (L)

000 – 070 Direct

070 – 180 Parallel

180 – 250 Teardrop

250 – 360 Direct



Method 1…The Arc

Arc = Opposite of Airplane Heading – Radial

Example #1

Hold west (270) at RMG VOR heading 330

Heading = 330

Bottom of heading indicator = 150

Radial = 270

Arc = 150 – 270 = -120

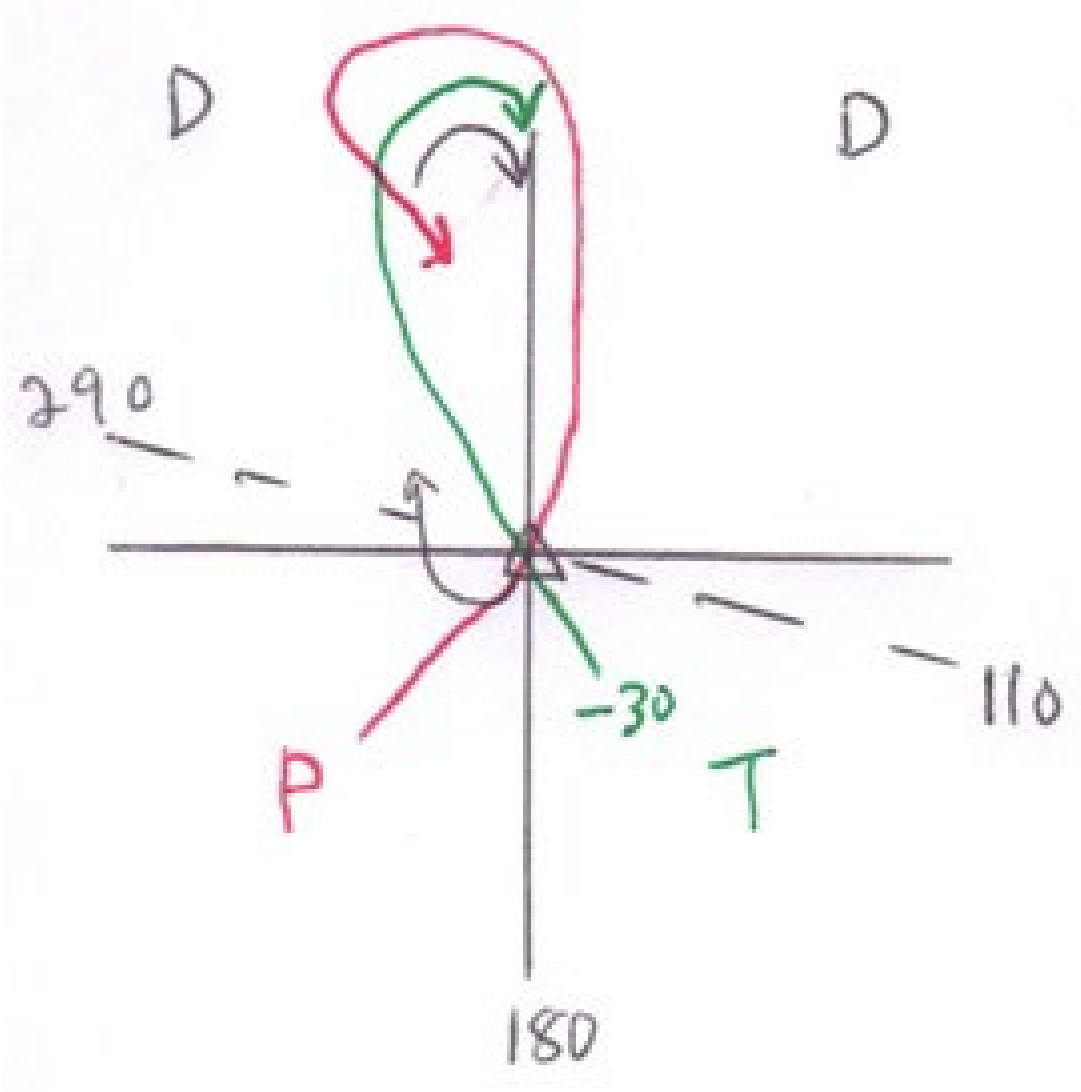
-120 + 360 => 240

Method 1…The Arc

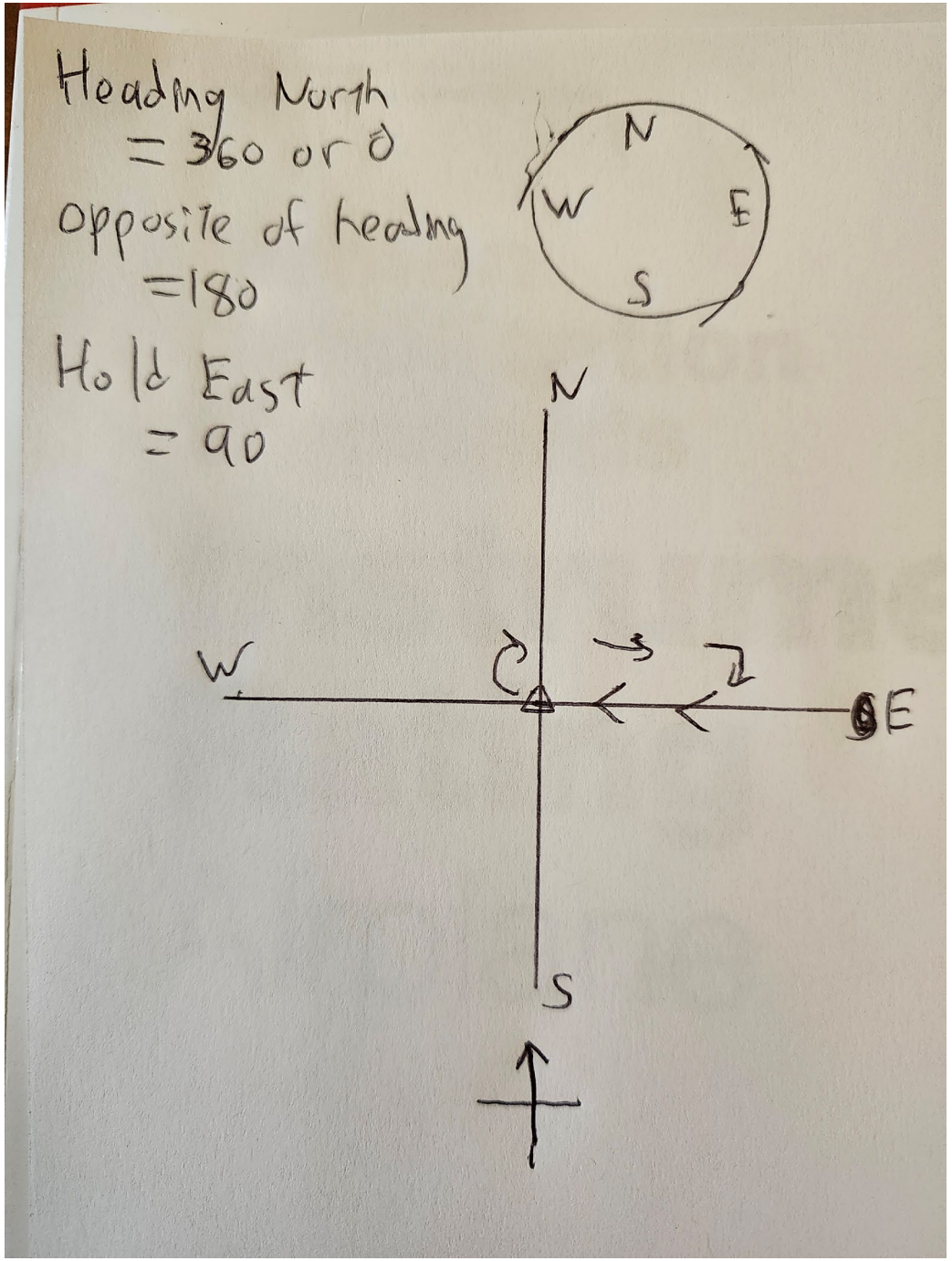
<u>Example #1</u>

Arc = -120 or 240

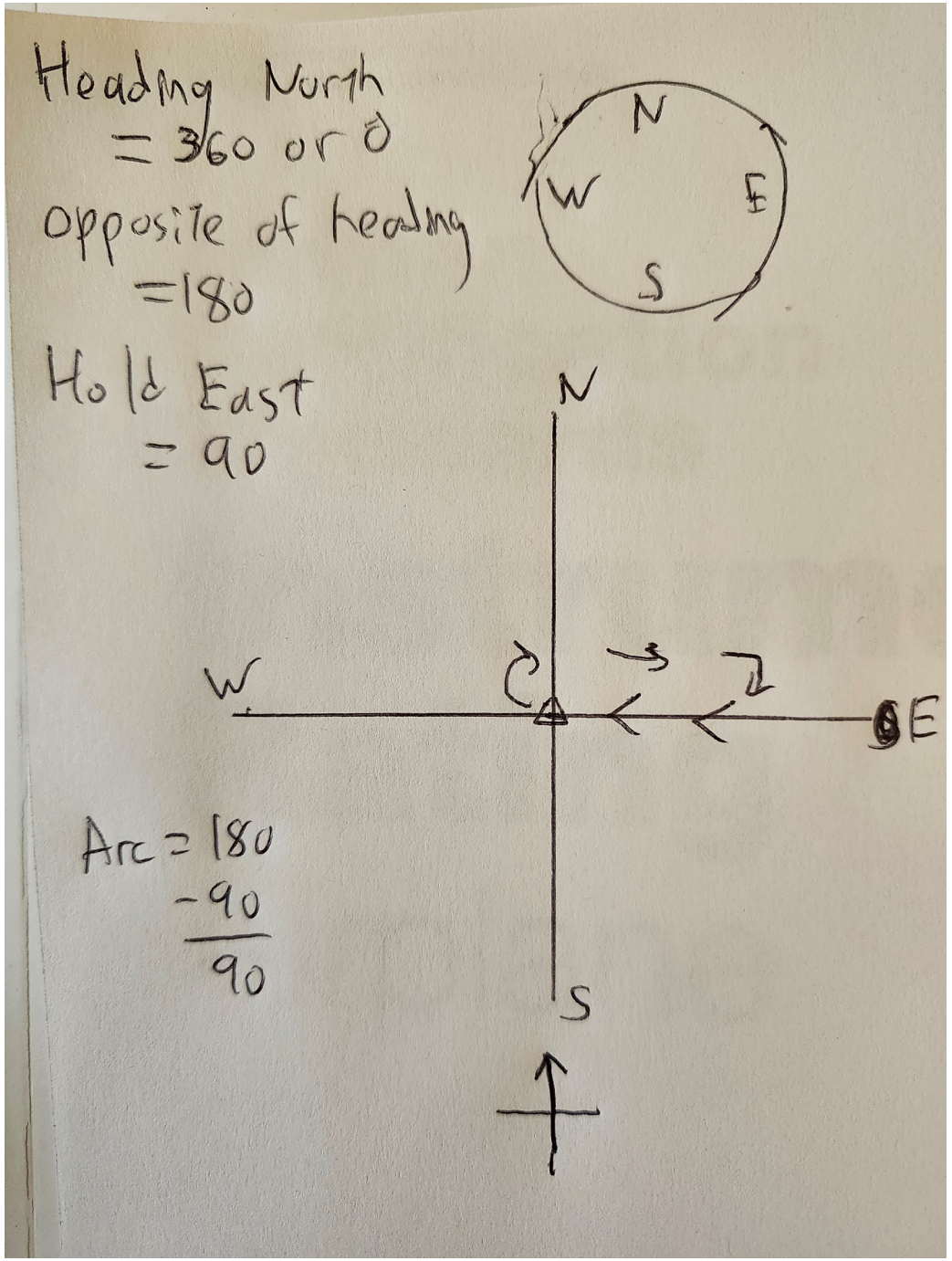
Parallel Entry



Example #2


Heading North
= 360 or 0
opposite of heading
= 180
Hold East
= 90
N
W
E
S
N
W
E
S

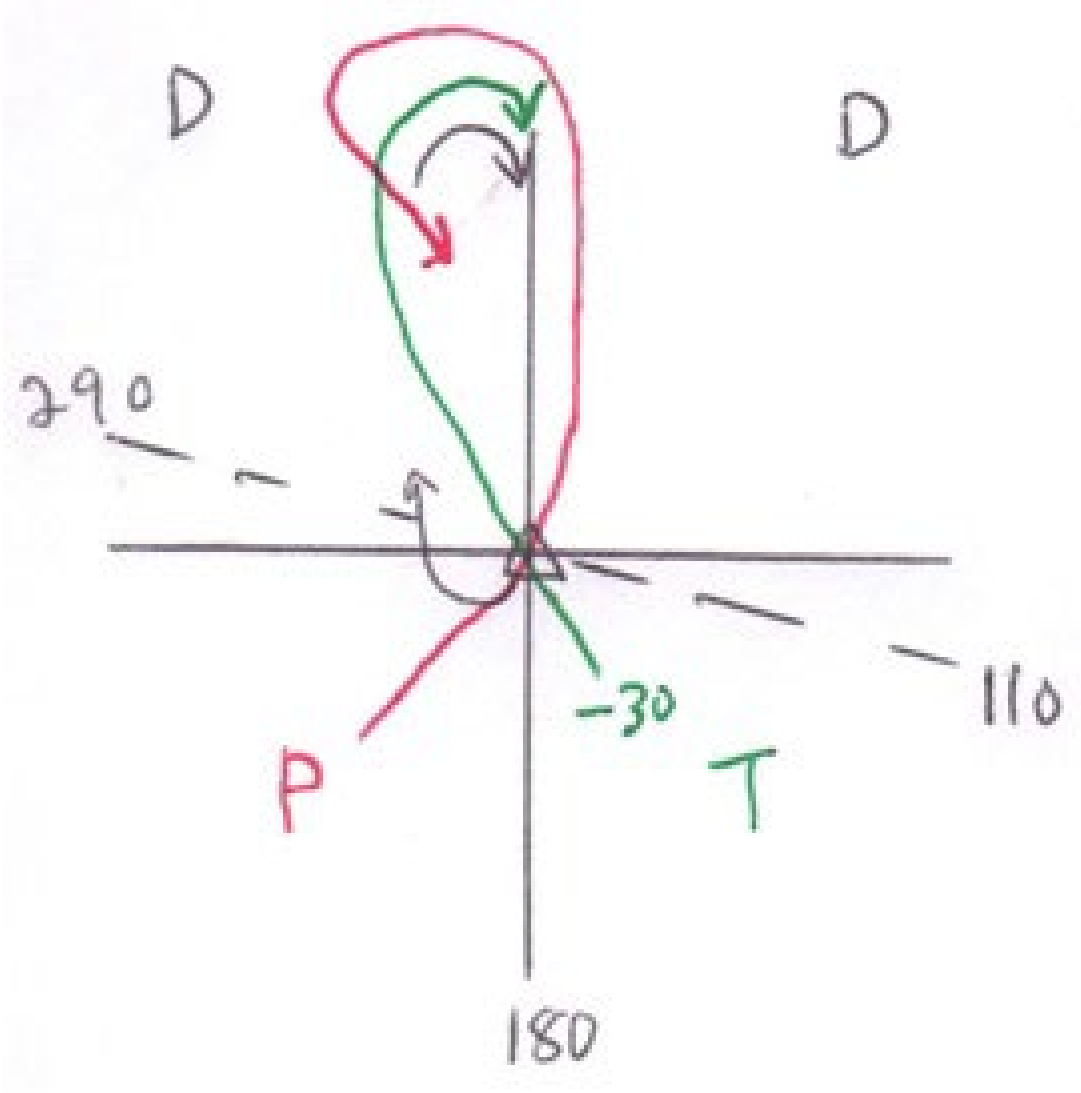
Example #2


Heading North
= 360 or 0
opposite of heading
= 180
Hold East
= 90
N
W
E
S
N
W
E
S
Arc = 180
-90
90

Example #2

Arc = 90

Direct is 0 to 110



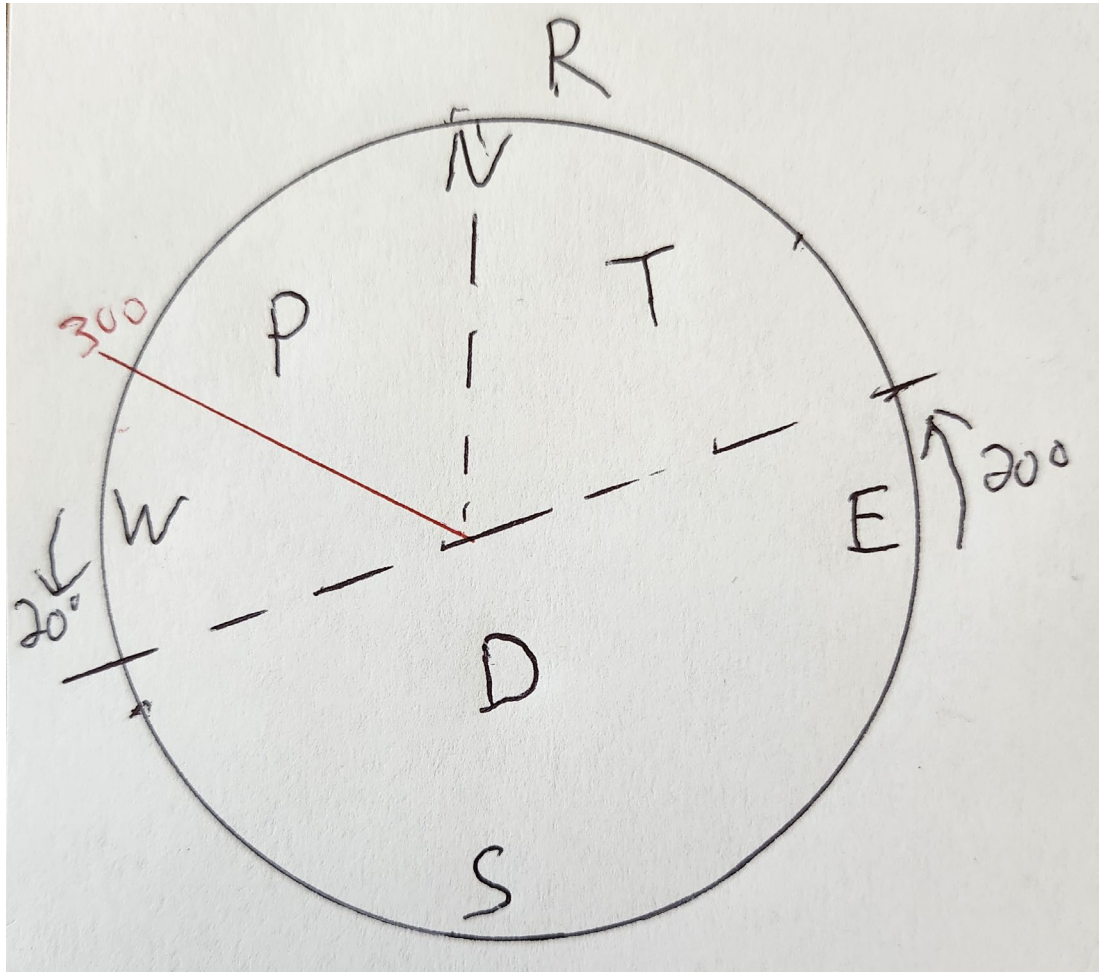
Method 2

<u>For right turns</u>

- Draw a horizontal line that is rotated up on the <u>right</u> side (CCW) 20 degrees
- Draw a vertical line from the middle to the top
- The large section is Direct
- The small section is Teardrop
- The medium section is Parallel

<u>Example</u>

If the outbound leg = 300 then do a Parallel entry



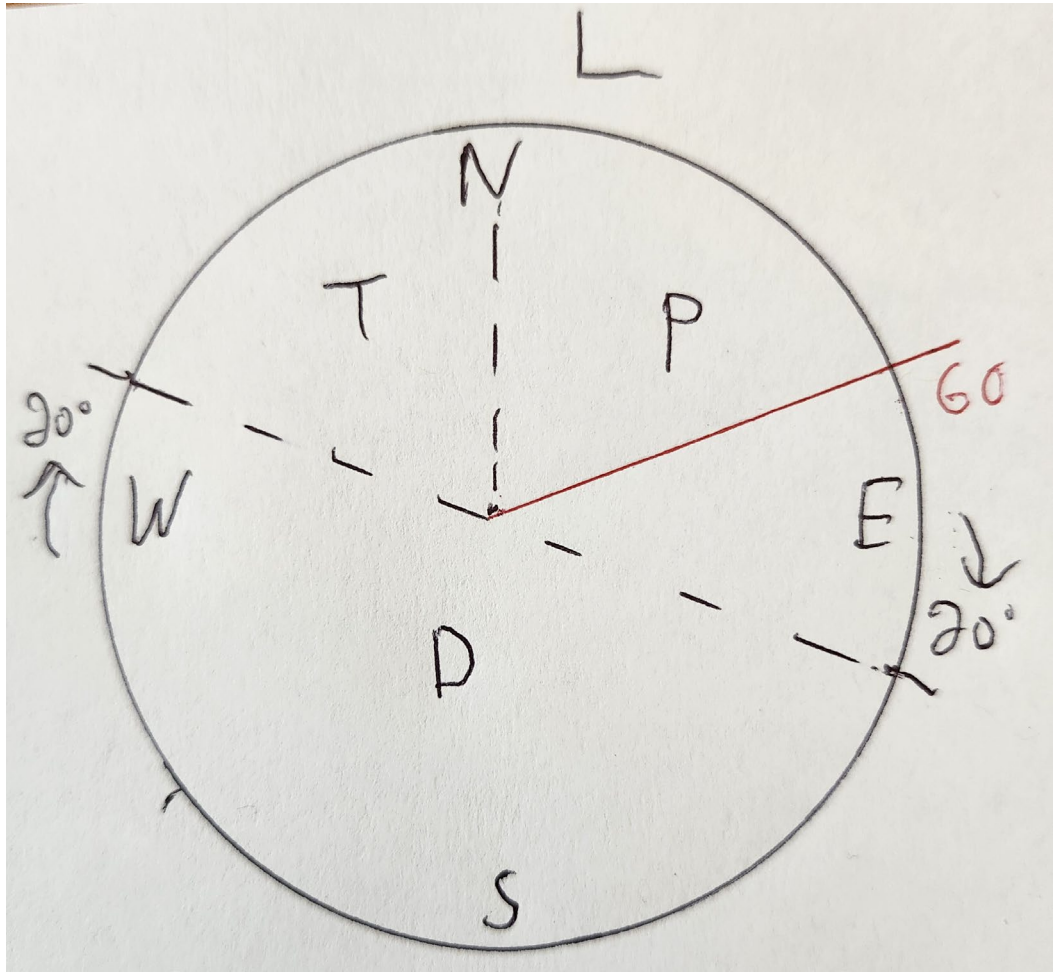
Method 2

<u>For left turns</u>

- Draw a horizontal line that is rotated up on the <u>left</u> side (CW) 20 degrees
- Draw a vertical line from the middle to the top
- The large section is Direct
- The small section is Teardrop
- The medium section is Parallel

<u>Example</u>

If the outbound leg = 60 then do a Parallel entry



Imagining on an HI

Hold on radial 210 right turns

180-210 = -30 => 330

Direct entry

Picture yourself turning around

Imagining on an HI

Hold on radial 330 right turns

180-330 = -150 => 210

Parallel entry

Picture entering and wanting to stay in protected space

Now let's play the holding game

- Pick a spot in the room on the floor…that becomes your VOR/GPS fix
- Stand south facing the VOR/GPS fix
- Hold on 210 right turns

(If needed look back 2 slides)

Now let's play the holding game

- Imagine you are pushing a grocery cart in a store down an aisle…what you are looking for must be on one of the next aisles…you have to do a left or right 180 to the next aisle…direct entry

Now let’s play the holding game

- Use the AvKnow App for random numbers for heading & holding radial
- Have a family member or friend pick two numbers from 0 to 35, then say right or left

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

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, 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.

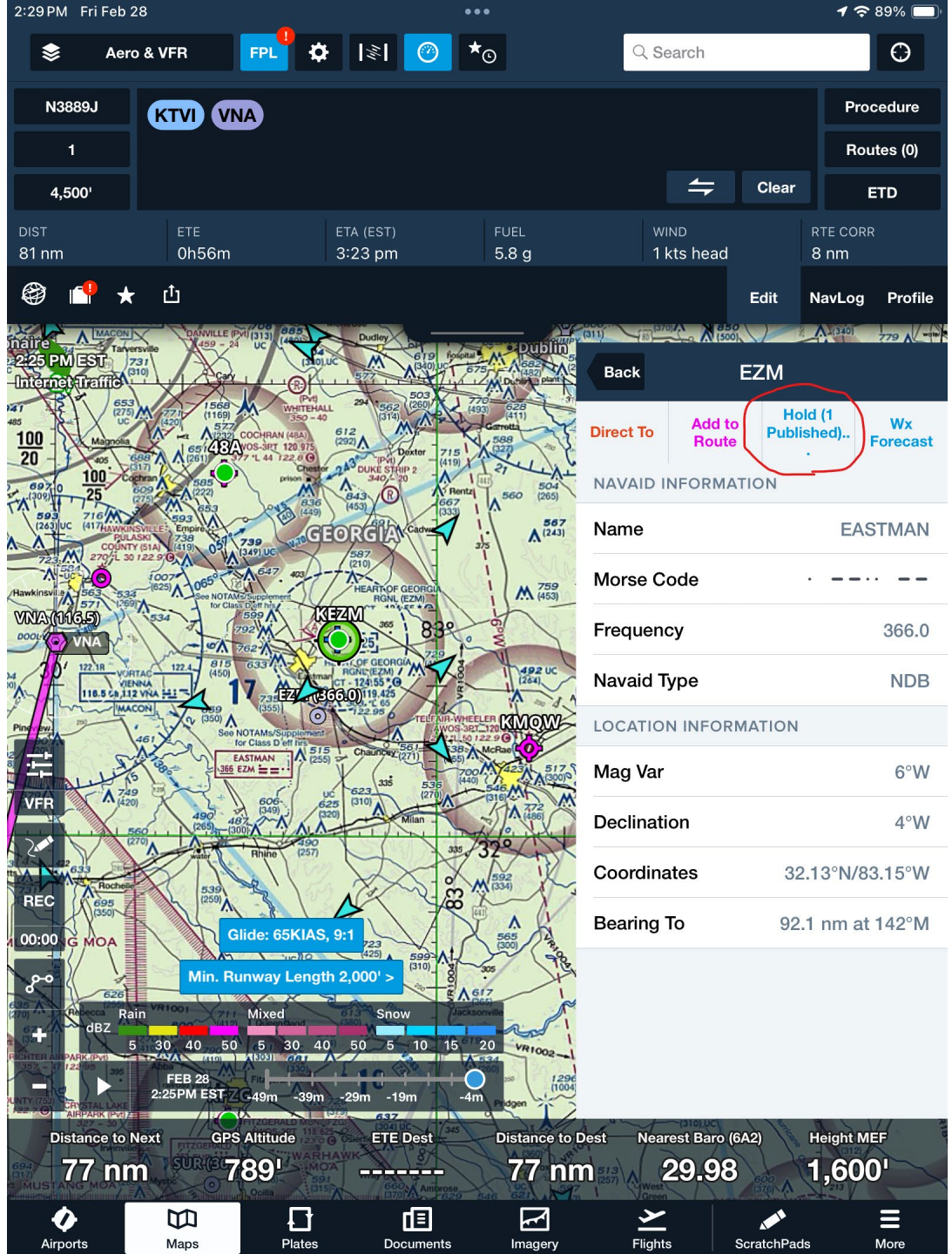
Lost Communications Translation

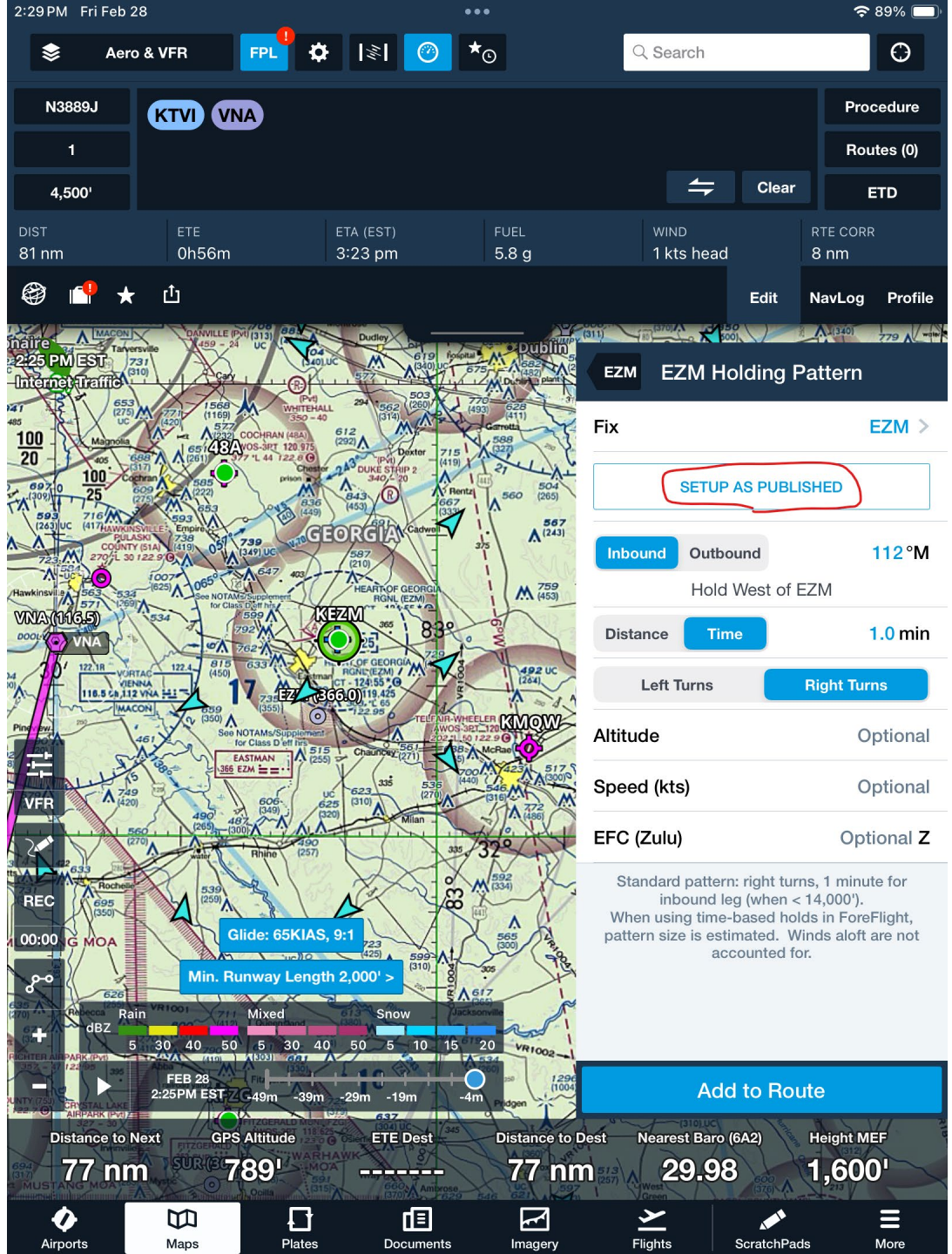
If the clearance limit is an IAF, leave as close as possible to the EFC time, if one has been issued.

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.


2:29 PM Fri Feb 28
89%
Aero & VFR
FPL
Search
N3889J
1
4,500'
KTVI
VNA
Procedure
Routes (0)
ETD
Clear
DIST 81 nm
ETE 0h56m
ETA (EST) 3:23 pm
FUEL 5.8 g
WIND 1 kts head
RTE CORR 8 nm
Edit
NavLog
Profile
2:25 PM EST
Internet Traffic
VNA (116.5)
KEZM
KMQW
GEORGIA
Back
EZM
Direct To
Add to Route
Hold (1 Published)..
Wx Forecast
NAVAID INFORMATION
Name EASTMAN
Morse Code · – – · ·· – –
Frequency 366.0
Navaid Type NDB
LOCATION INFORMATION
Mag Var 6°W
Declination 4°W
Coordinates 32.13°N/83.15°W
Bearing To 92.1 nm at 142°M
VFR
REC
00:00
Glide: 65KIAS, 9:1
Min. Runway Length 2,000' >
Rain
Mixed
Snow
dBZ
FEB 28
2:25PM EST
Distance to Next 77 nm
GPS Altitude 789'
ETE Dest --------
Distance to Dest 77 nm
Nearest Baro (6A2) 29.98
Height MEF 1,600'
Airports
Maps
Plates
Documents
Imagery
Flights
ScratchPads
More


2:29 PM Fri Feb 28
89%
Aero & VFR
FPL
Search
N3889J
1
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Procedure
Routes (0)
ETD
Clear
DIST 81 nm
ETE 0h56m
ETA (EST) 3:23 pm
FUEL 5.8 g
WIND 1 kts head
RTE CORR 8 nm
Edit
NavLog
Profile
2:25 PM EST
Internet Traffic
GEORGIA
VNA (116.5)
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Glide: 65KIAS, 9:1
Min. Runway Length 2,000' >
Rain
Mixed
Snow
dBZ
FEB 28
2:25PM EST
VFR
REC
00:00
EZM
EZM Holding Pattern
Fix
EZM
SETUP AS PUBLISHED
Inbound
Outbound
112 °M
Hold West of EZM
Distance
Time
1.0 min
Left Turns
Right Turns
Altitude
Optional
Speed (kts)
Optional
EFC (Zulu)
Optional Z
Standard pattern: right turns, 1 minute for inbound leg (when < 14,000').
When using time-based holds in ForeFlight, pattern size is estimated. Winds aloft are not accounted for.
Add to Route
Distance to Next
77 nm
GPS Altitude
789'
ETE Dest
Distance to Dest
77 nm
Nearest Baro (6A2)
29.98
Height MEF
1,600'
Airports
Maps
Plates
Documents
Imagery
Flights
ScratchPads
More

Any questions I can answer or follow up later on?