Area of Operation **VII** - Task **B**

Holding Procedures

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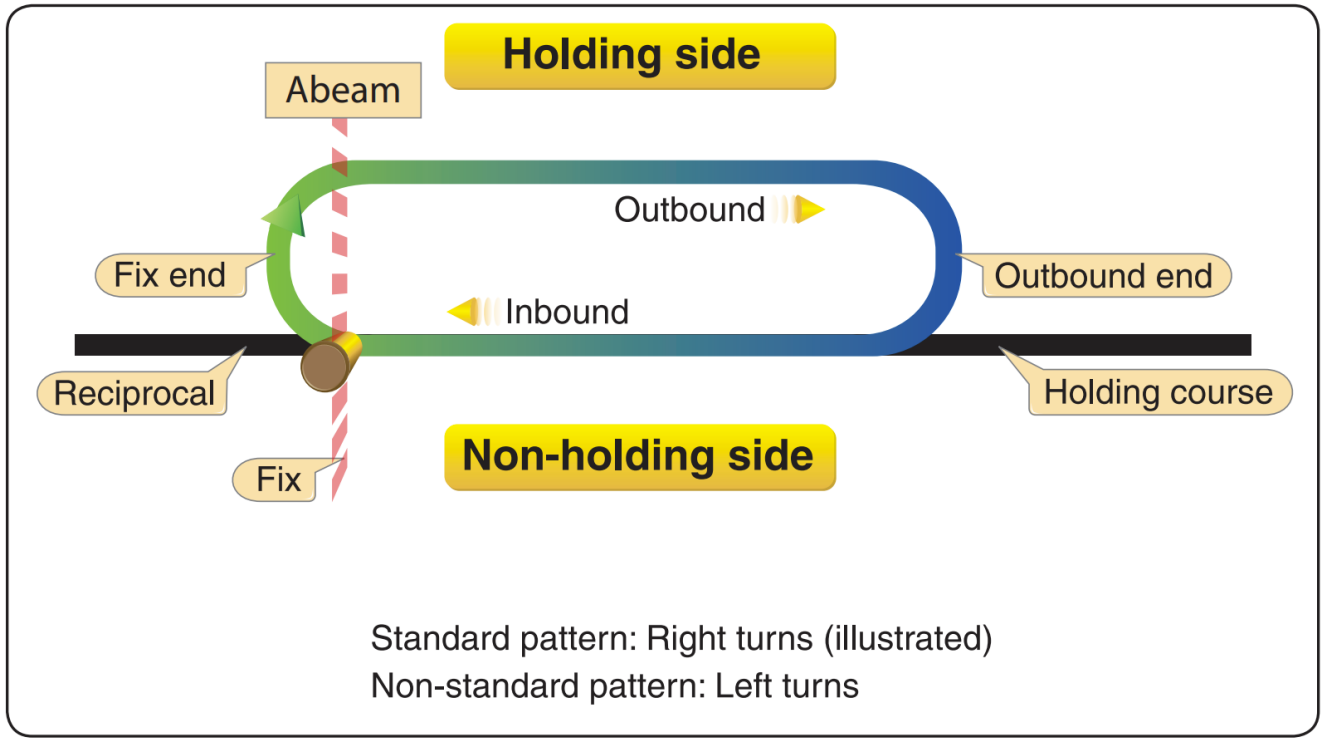
Key References:
- Instrument Flying Handbook
- AIM

1. Introduction

AIM 5-3-8

- **What**: IFR maneuver used to keep a plane in a specific protected area for a certain amount of time
- **Why**: Delays, weather, and other criteria can result in holding, which is expected to be performed as instructed

- **Holding Basics**:
  - Standard Holding Pattern
    - Right turns
    - 1-minute inbound leg ≤ 14,000' MSL
    - 1.5-minute inbound leg > 14,000' MSL
  - Holding Airspeeds
    - ≤ 6,000' ➔ 200 knots
    - 6,001' and 14,000' ➔ 230 knots
    - 14,001' ➔ 265 knots



2. Hold Instructions

- **Usually "Hold as published"**
  - ATC will give you the fix
- **If not published, ATC will give you:**
  - Direction of holding from the fix
  - Holding fix
  - Radial, course, bearing, airway or route to hold on
  - Leg length in miles if DME/RNAV
  - Turn direction (if left turns)
- **ATC will give you EFC time** *(Expect Further Clearance)*
- **If arrived at your clearance limit without a clearance beyond it:**
  - Maintain the last altitude
  - Hold as depicted
  - If no depiction: Standard hold on the approach course

"N436SP hold south of the Cedar Lake VOR as published. Expect further clearance at 12:30 Zulu."

2. Hold Instructions

DFRATE

"N436SP hold west of the East Texas VOR, 290 radial, 20 DME, 4000, left turns, 5-mile legs. Expect further clearance at 12:30 Zulu"

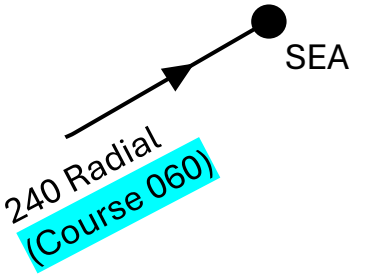
- **Protected Area:**
  - Defined by the TERPS criteria (Standards for Term. Instr. Procedures)
  - Uses complex tables to determine how wide a holding area must be
  - The protected area is always on the side of the holding (do not turn to the wrong side)
- **Always write down holding procedures**
- **Do not confuse "Radial" vs "Course"**
  - Ex: 290 radial → 110 Course
  - ATC may give you either one

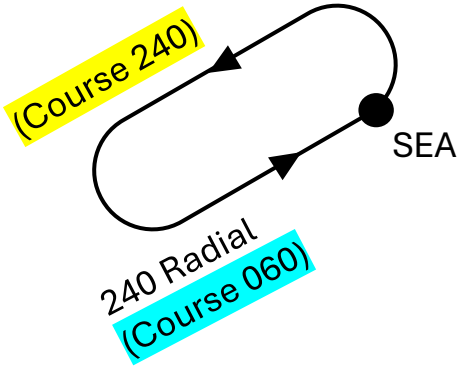
3. Drawing a Hold

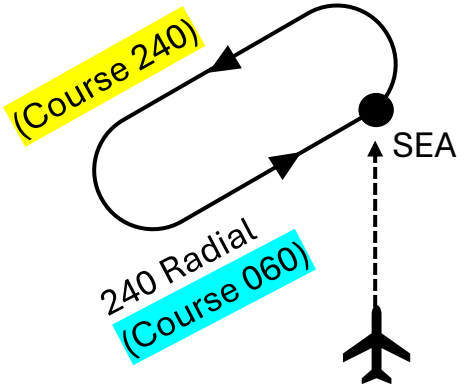
- **On Paper**
  - Draw the holding fix
  - Draw the inbound leg
  - Note the inbound course
  - Draw the 1st 180º turn
  - Draw the outbound leg & turn
  - Note the outbound heading
  - Verify the hold
  - Draw your location
  - Select and draw the entry procedure

"Hold West of SEA, Radial 240, Left Turns…"

- **Directly on the HDG/HSI**
  - Head towards the fix
  - Follow steps above using the HSI compass as reference *(your airplane at the fix)*
  - Select entry procedure



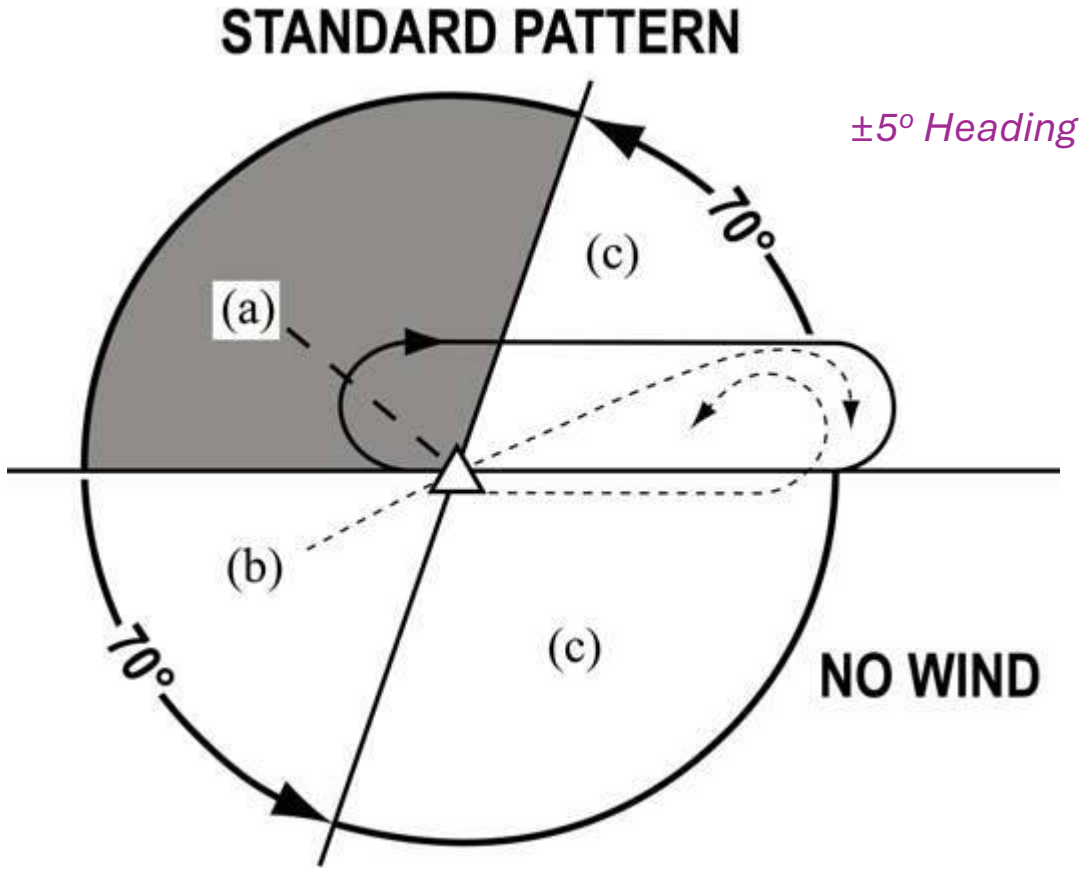




4. Entry Procedures

AIM 5-3-8

- **Parallel (a)**
  - Approaching from anywhere in the gray (a) area
  - Parallel the hold outbound for 1 minute
  - Turn > 180º toward the hold to intercept inbound
- **Teardrop (b)**
  - Approaching from anywhere in the (b) area
  - Fly 30º into the hold for 1 minute
  - Turn in the direction of the hold to intercept inbound
- **Direct (c)**
  - Approaching from anywhere in the (c) area
  - Turn in the direction of the hold to the outbound leg
  - Slow to hold speed within 3 minutes of the holding fix



Practice holds

- Note 1: The Pilot is expected to Fly Over the fix before initiating an entry
- Note 2: When using RNAV lateral guidance for holding, it is permissible to allow the system to compute the holding entry

4. Entry Procedures | Example 1

Going back to the previous example – what entry should be performed?

"Hold West of SEA, Radial 240, Left Turns…"

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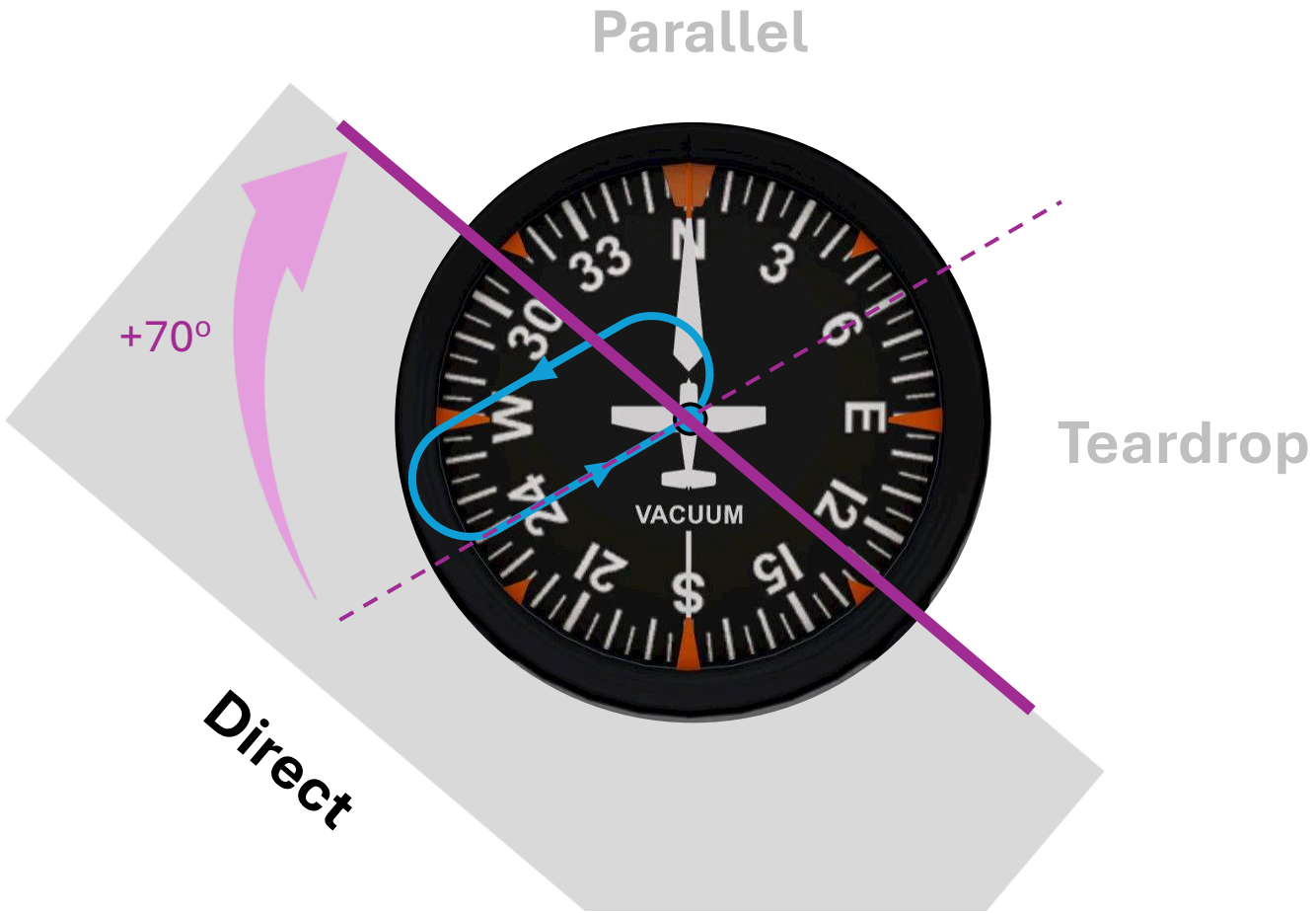
A: DIRECT



4. Entry Procedures | Example 2

Another Example – what entry should be performed?

"Hold NE of SEA, Course 240…"

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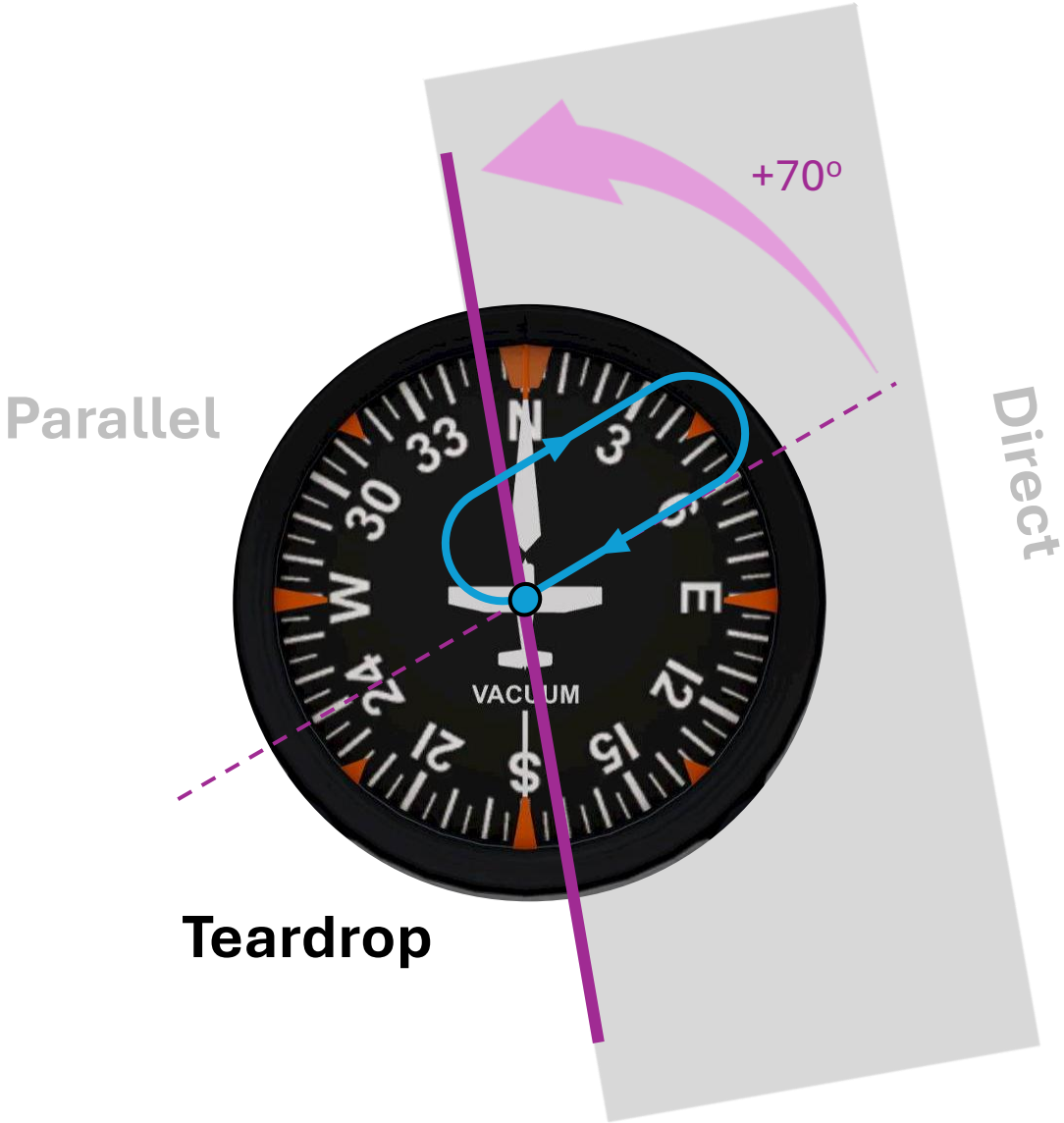
A: TEARDROP
(turn heading 030 after crossing the fix)



4. Entry Procedures | Thumb Method

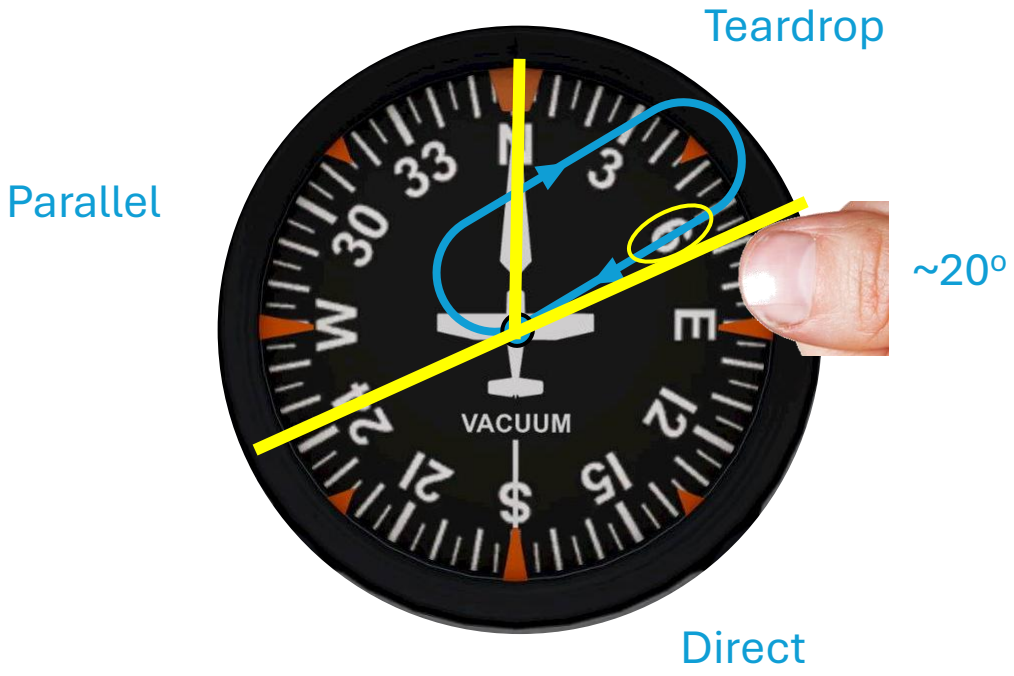
1. **Place your thumb** (about 20º above the perpendicular line): **Left Thumb ➔** Left Turns, **Right Thumb ➔** Right Turns
2. **Draw imaginary lines ➔** Above the thumb is TEARDROP, below is DIRECT, opposite is PARALELL
3. **See your OUTBOUND heading ➔** The sector it falls will be your entry method

"Hold West of SEA, Radial 240, Left Turns…"

A: DIRECT

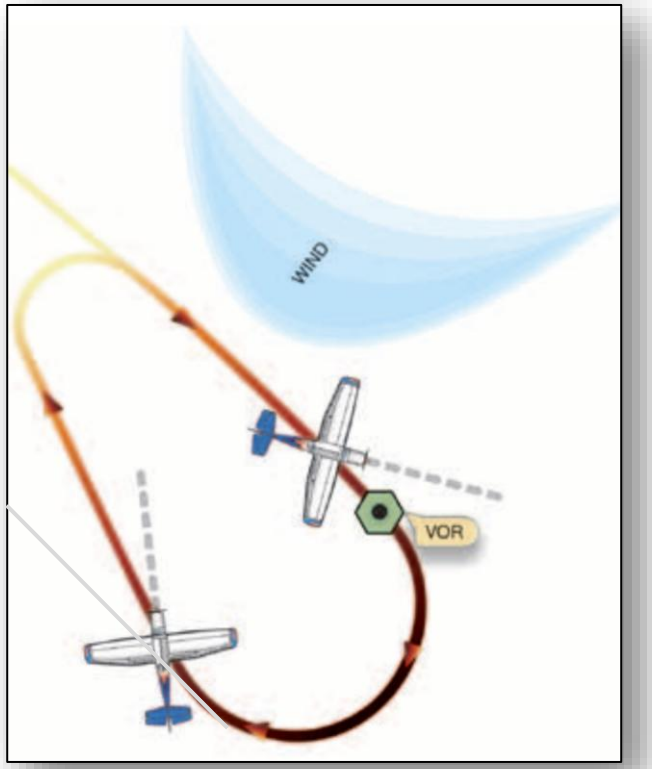
"Hold NE of SEA, Course 240…"

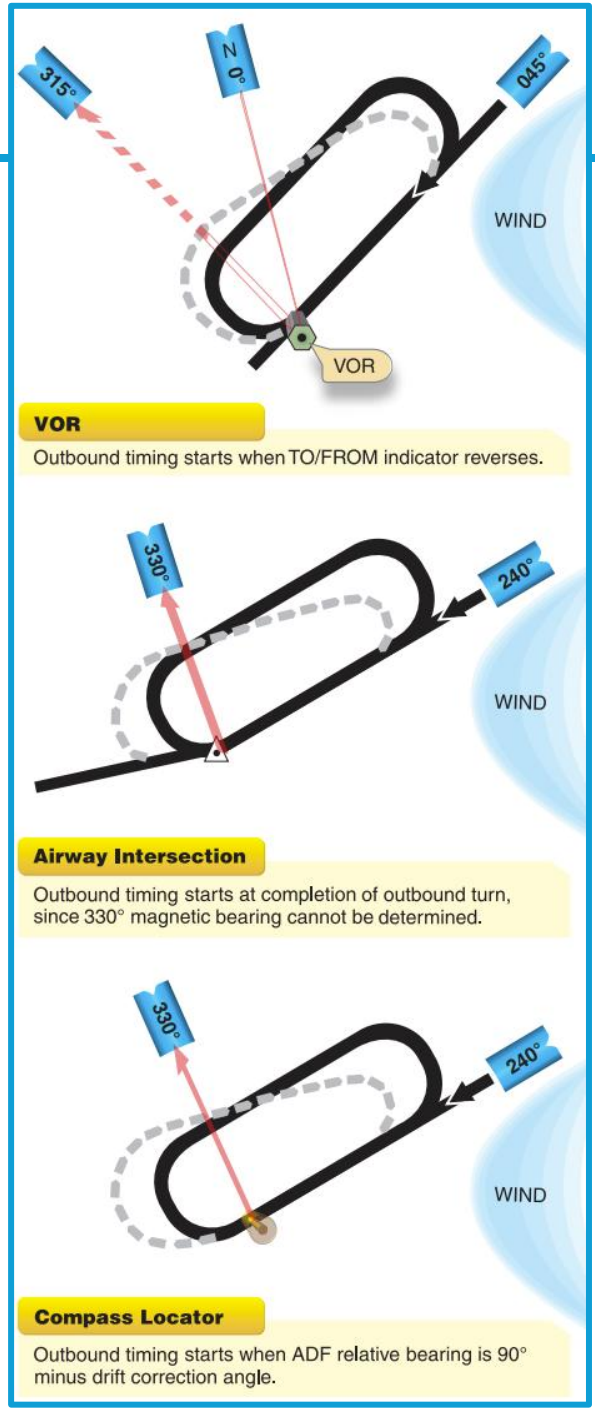
A: TEARDROP *(turn heading 030 after crossing the fix)*



5. Flying a Hold

- **Use heading bug and OBS to track inbound/outbound**
- **Timing Begins:**
  - Over or abeam the holding fix, whichever is later
  - VOR: When the To/From flag reverses
  - Airway Intersection or if abeam cannot be determined: Completion of the outbound turn
  - Compass Locator: ADF RB is 90º minus drift correction
  - DME Fix: turn reaching the specified DME distance
- **Wind Correction**
  - Inbound Leg:
    - Crab into the wind to maintain course
    - Note WCA required
  - Outbound Leg:
    - 3x the inbound WCA
      (e.g. 4º inbound → 12º outbound)
    - ✓ *Triple to compensate for 2 turns and the normal outbound leg crab*





6. Communications

- **Mandatory Reporting at all times** [AIM 5-3-3]
  - (a)(1)(f) ➔ The time and altitude or flight level upon reaching a holding fix or point to which cleared
  - (a)(1)(g) ➔ When leaving any assigned holding fix or point

- **Lost Communication Procedure ➔ Leaving the Clearance Limit (CL)** [91.185]
  - Hold until time to leave the CL
  - If the fix is a point where approach begin
    - ✓ *Start descent/approach as close as possible to the EFC*
    - ✓ *If no EFC ➔ leave as close as possible to the ETA based on ETE*
  - Otherwise
    - ✓ *Proceed to the fix where the approach begins at the EFC (or upon arrival at the Clearance Limit if no EFC)*
    - ✓ *Start the descent/approach as close as possible to the ETA*

7. Setting up Holds in the Navigator

- **Garmin 650/750 (similar to all other Garmin touchscreen GPS)**
  - Select the 'Flight Plan' icon from the main menu
  - Add/select waypoint in flight plan from the Active Flight Plan
  - Select 'Hold at Waypoint' from the Waypoint Options menu
  - Select the holding course received by ATC using the 'Course Direction" option
  - Select right or left turns if applicable
  - Select the 'Leg Type' depending on time or distance, and set time/distance
  - If an EFC is received, you can enter it there
  - Select 'Load Hold' to activate

- **G1000**
  - Select the 'Flight Plan' and highlight the waypoint
  - 'Menu' and select 'Hold at Waypoint'
  - Similar steps as above

If you received a Radial from ATC, instead of a Course, load the "Direction" as "Outbound"

Questions?