



EIGHTS ON PYLONS



OVERVIEW

WHAT

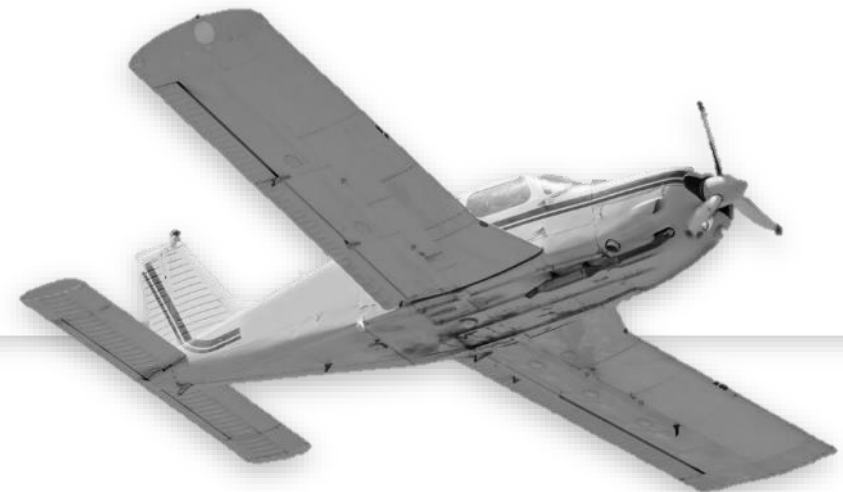
- Maneuver in which attention is directed at maintaining a pivotal position on a pylon
- Involves flying in a figure eight around two selected points, or pylons, on the ground
- No attempt is made to maintain a uniform distance from the pylon
- The goal is to have an imaginary line extending from the pilot's eyes to the pylon

WHY

- Develops the ability to maneuver accurately while dividing attention between the flight path and the points on the ground
- Extremely helpful in teaching, developing, & testing subconscious control of the plane

CONTENT

- What is Pivotal Altitude?
- The Basics
- Calculating Pivotal Altitude
- Performing Eights on Pylons



PIVOTAL ALTITUDE

WHAT IS IT?

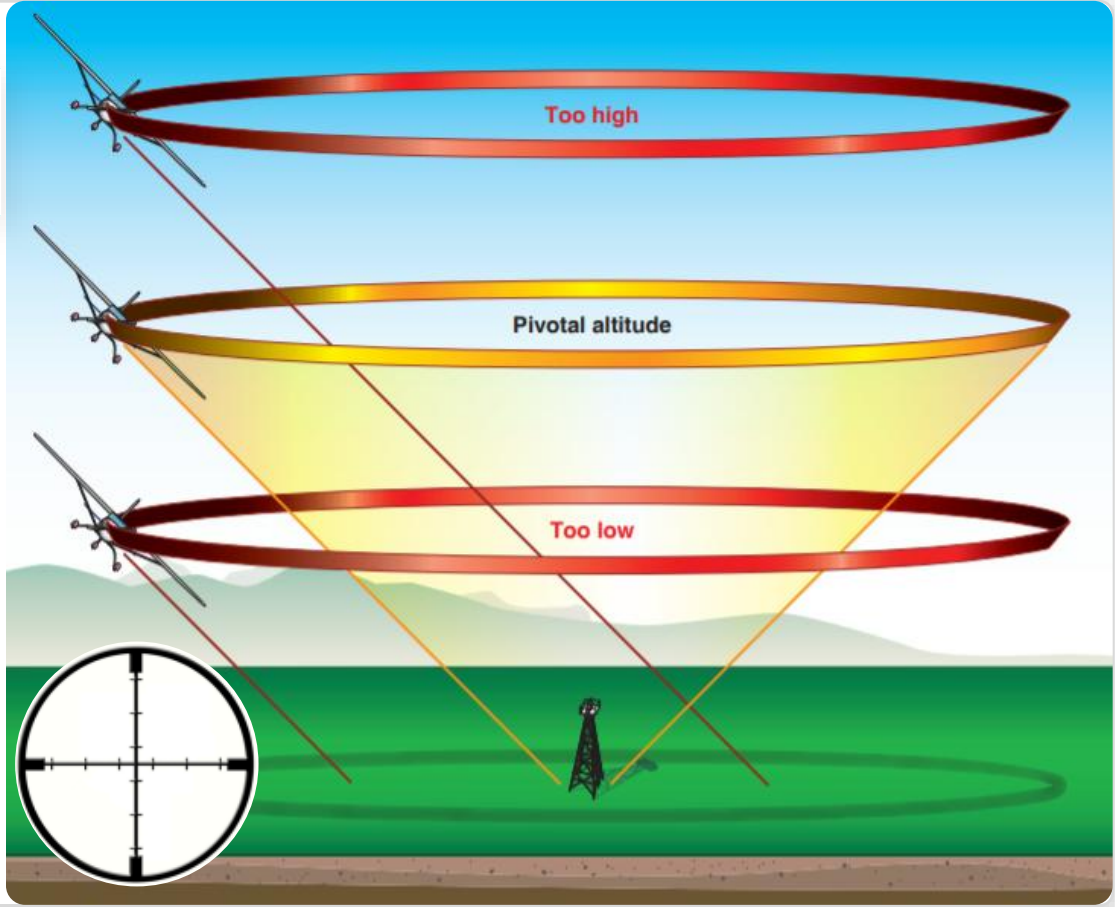
Altitude which keeps a pylon in the same position as the plane turns around it

Varies with groundspeed

Reference line is parallel to lateral axis

Pivotal Altitude (PA) & Reference Line

- At PA: Appears to be fixed to the ground
- Above PA: Appears to move backward
- Below PA: Appears to move forward



PIVOTAL ALTITUDE BASICS

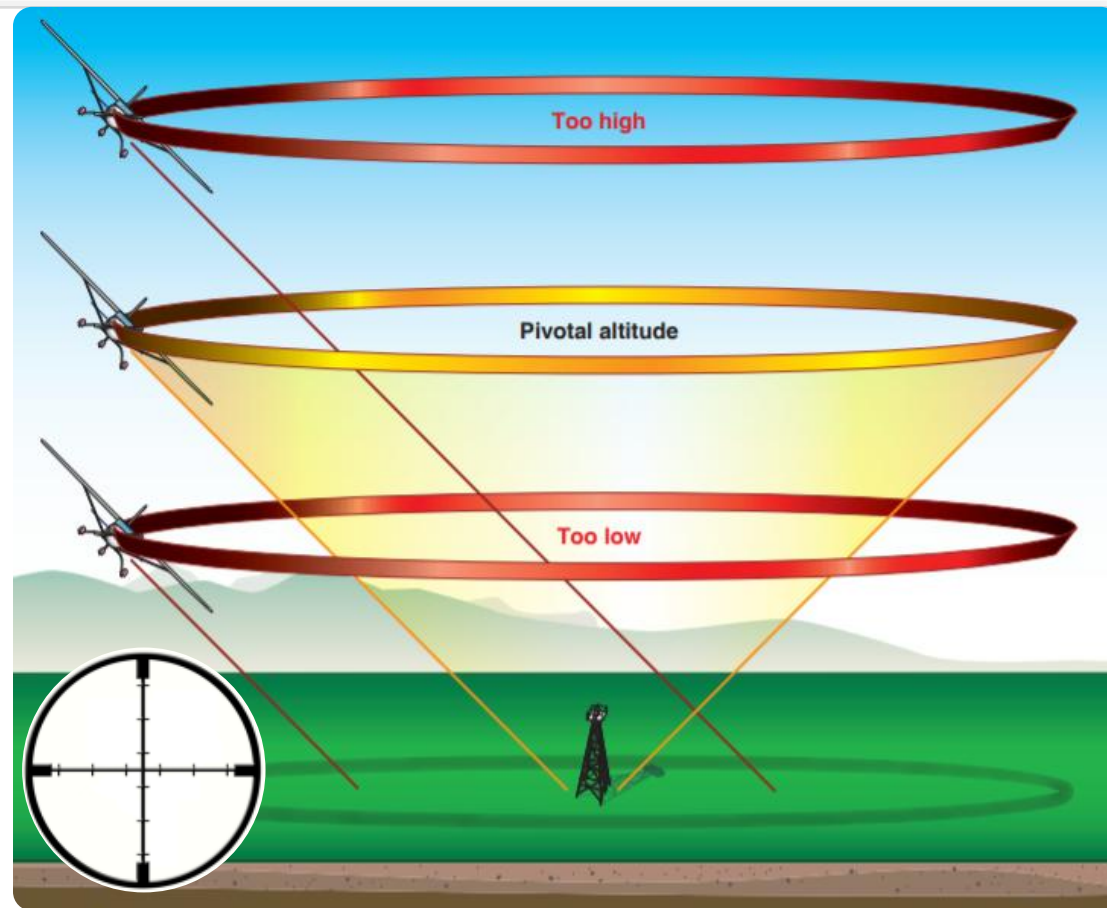
BASED ON GROUND SPEED

PA varies with groundspeed

PA doesn't change with bank angle

- Distance from the pylon affects bank angle

As groundspeed changes, climb or descends to maintain PA and the aircraft reference in relation to the pylon



PIVOTAL ALTITUDE BASICS

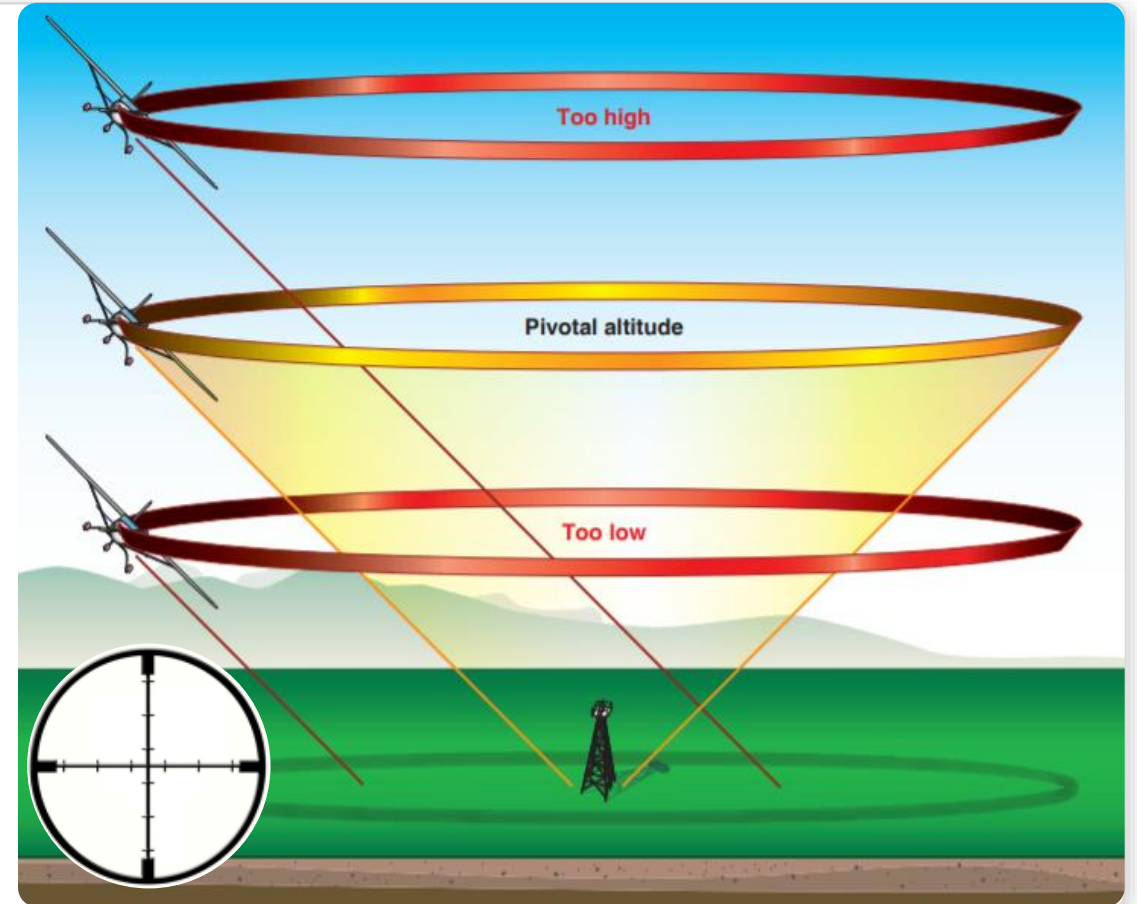
PA & PITCH

As groundspeed decreases, so does PA

- Aircraft reference moves backward over the ground & pylon moves forward
- Descend to maintain the reference line
- **Rule: If the point moves forward, apply forward pressure**

As groundspeed increases, so does PA

- Aircraft reference moves forward over the ground & pylon moves backward
- Climb to maintain the reference line
- **Rule: If the point moves backward, apply back pressure**



PIVOTAL ALTITUDE BASICS

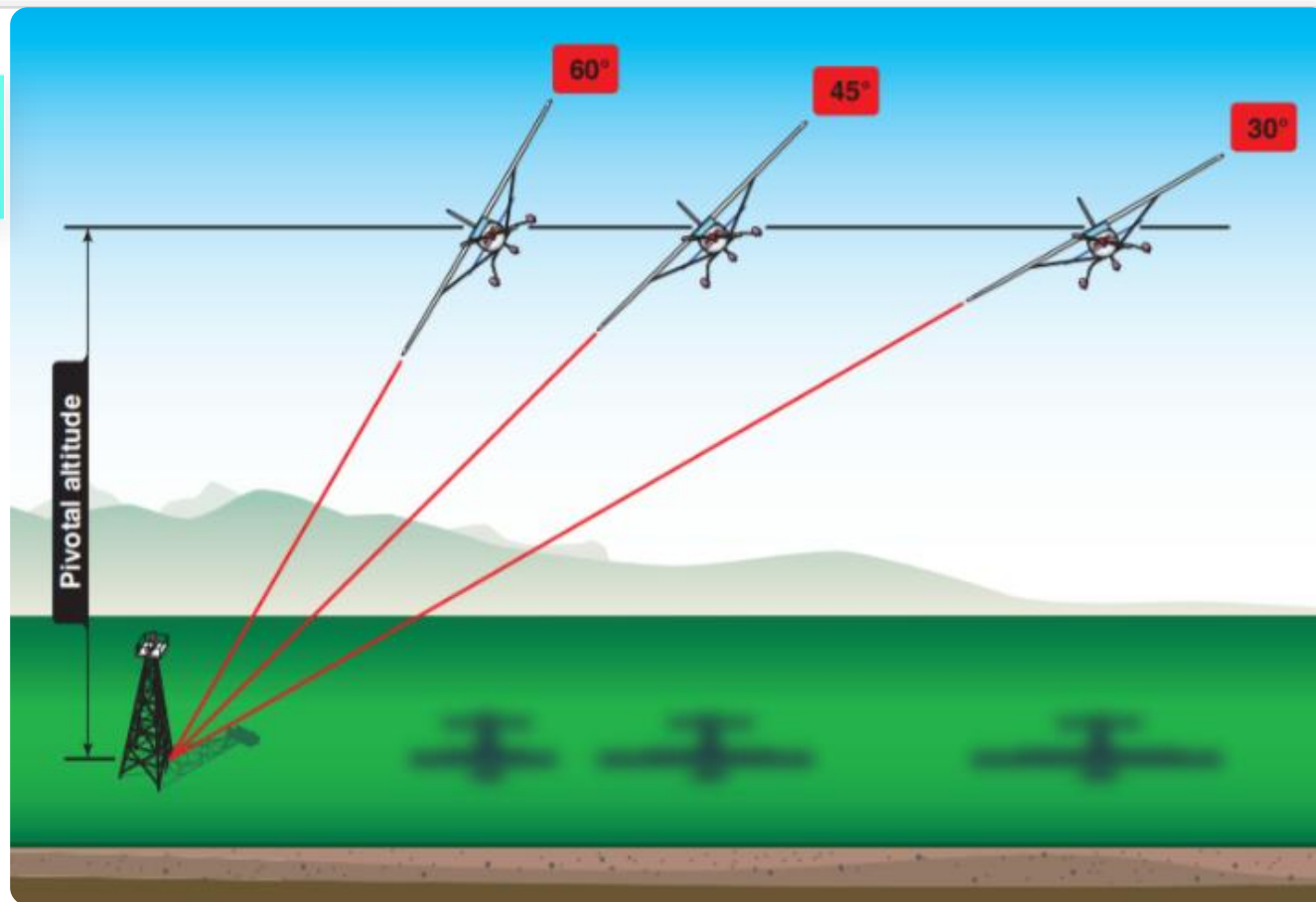
PA & BANK

Distance from the pylon affects bank

As wind pushes you to/from a pylon, bank is used to maintain the reference line

Rules

- If the pylon moves above the aircraft reference, decrease bank
- If the pylon moves below the aircraft reference, increase bank

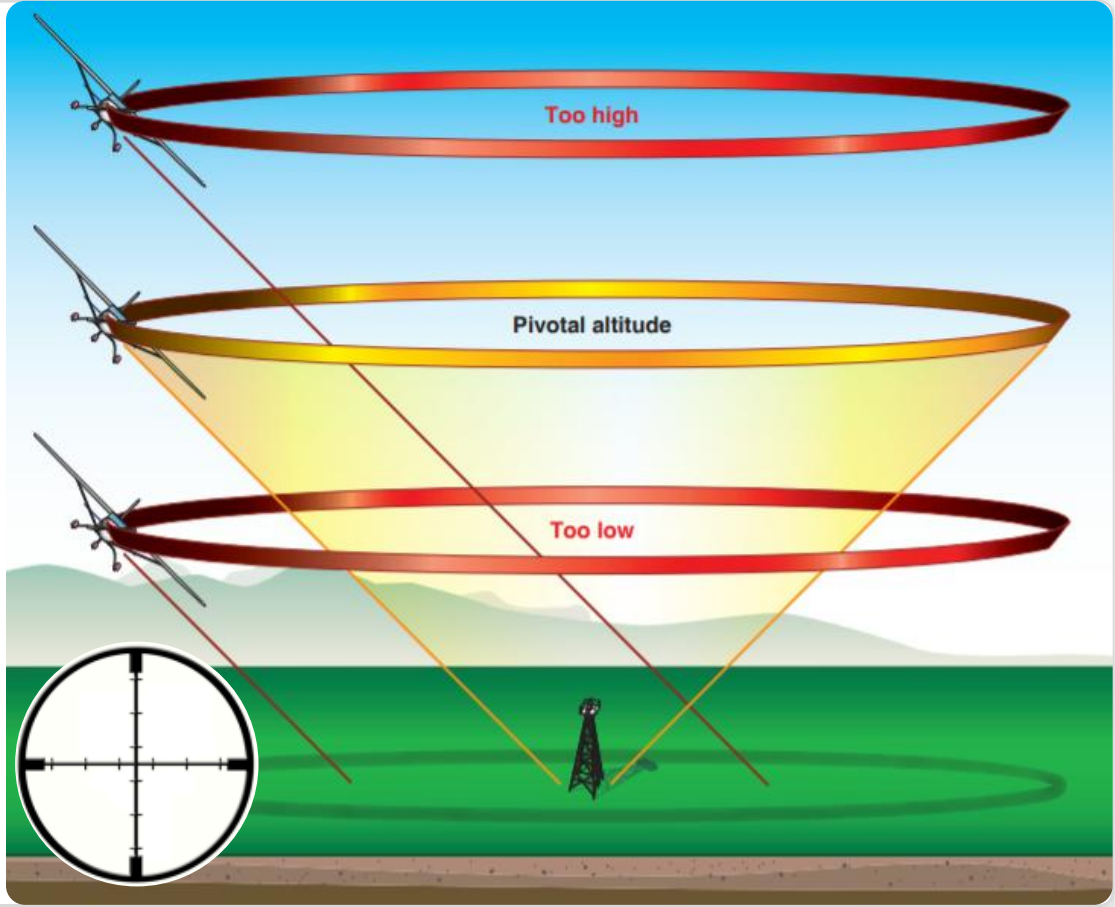


PIVOTAL ALTITUDE BASICS

ENERGY MANAGEMENT & POWER

Set power prior to entering the maneuver

Incorrect power settings lead to changes in airspeed which change PA



PIVOTAL ALTITUDE

CALCULATING PIVOTAL ALTITUDE

Equations

- Knots: $(Groundspeed^2 \div 11.3) + MSL$
- MPH: $(Groundspeed^2 \div 15) + MSL$

Calculate the highest & lowest PA

- Highest = TAS + tailwind
- Lowest = TAS – headwind
- If altitudes are unsafe, do not perform the maneuver

Groundspeed		Approximate Pivotal Altitude
Knots	MPH	
87	100	670
91	105	735
96	110	810
100	115	885
104	120	960
109	125	1050
113	130	1130

EIGHTS ON PYLONS

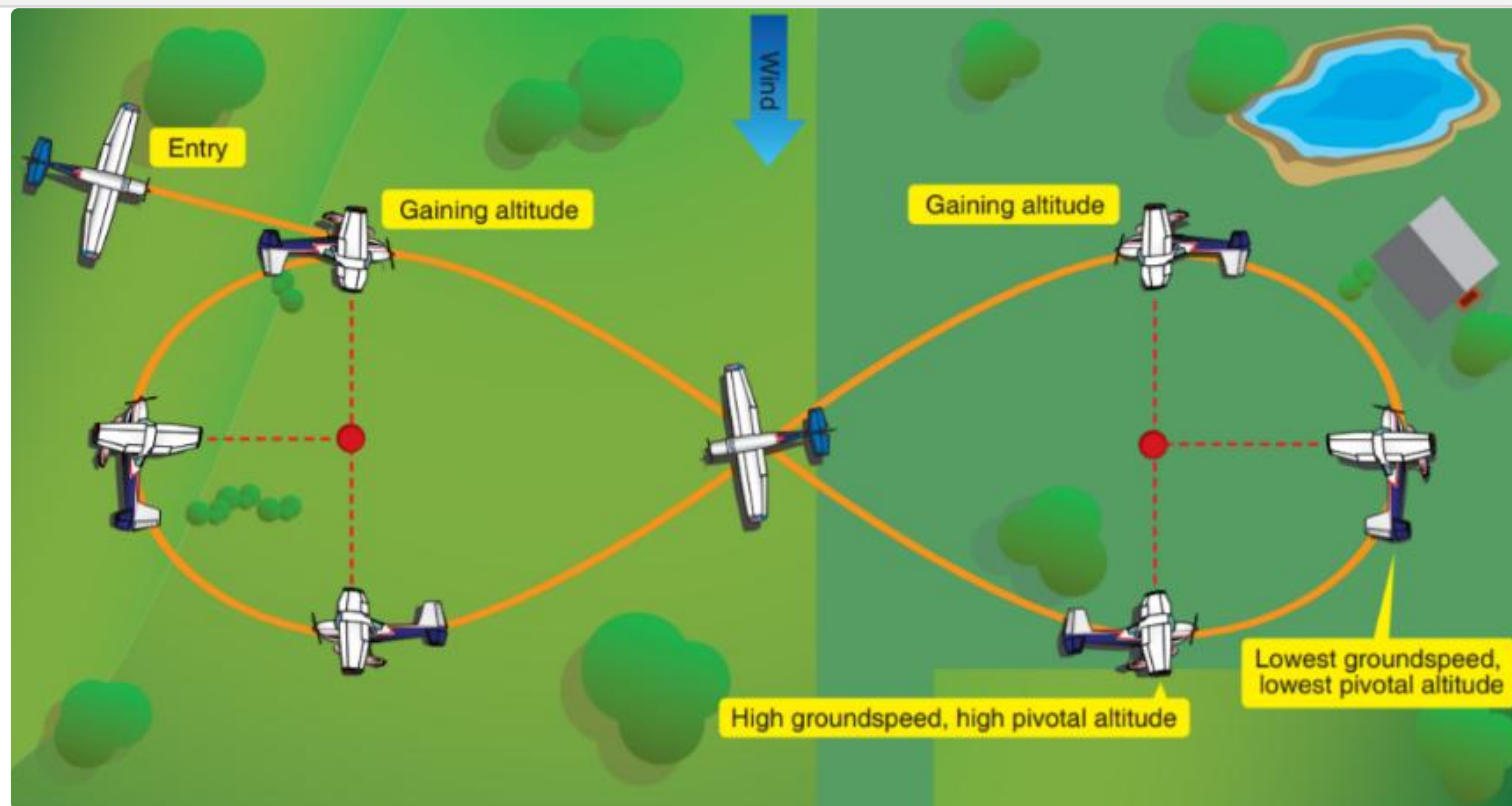
SELECTING PYLONS

Two points on a line
perpendicular to the wind

About ½ mile apart

Prominent, easy to see, & away
from obstructions

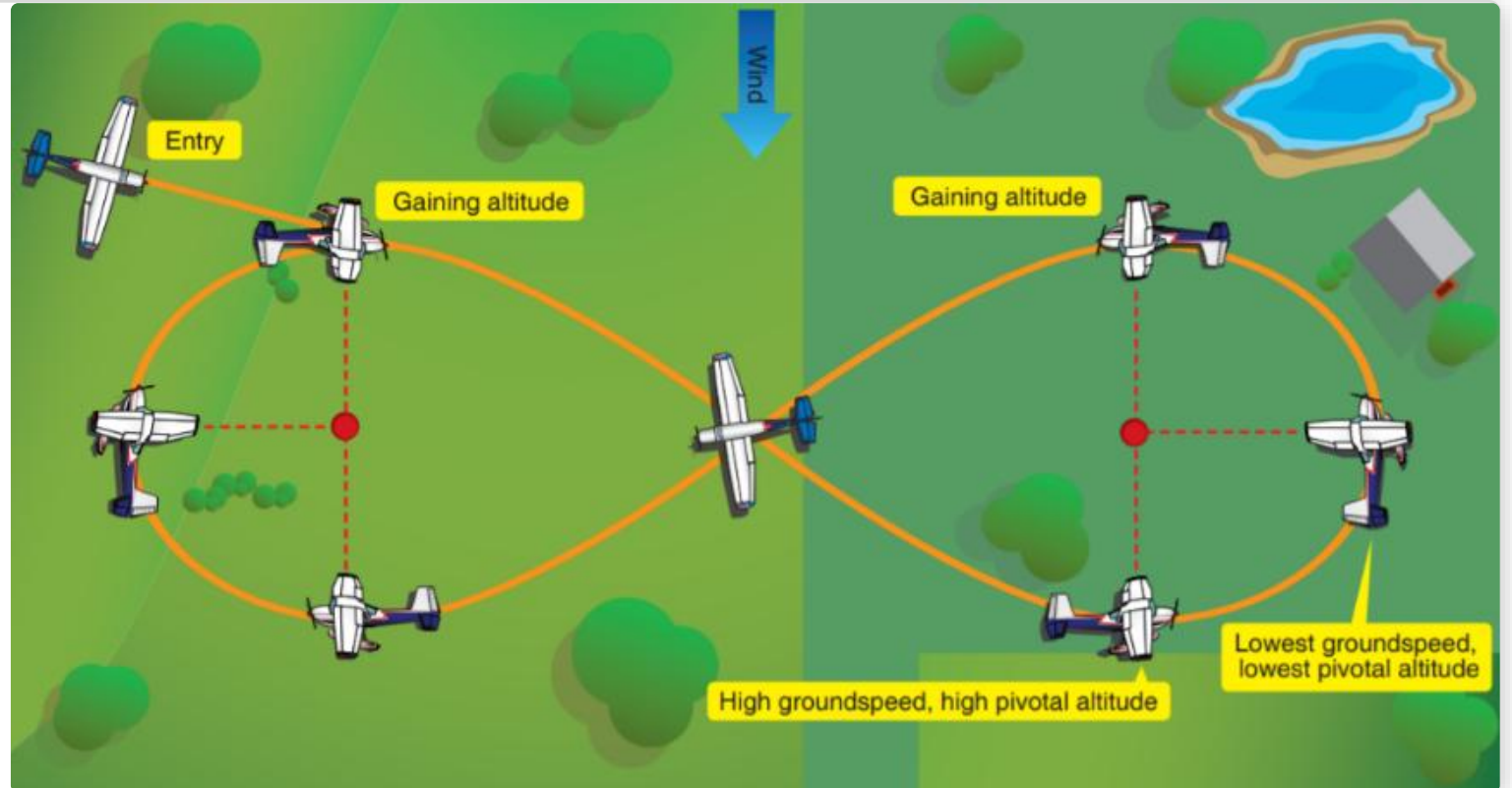
Emergency landing area in
gliding distance



EIGHTS ON PYLONS

PRE-MANEUVER

- Pre-maneuver checklist
- Clear the area
- At pivotal altitude
- On airspeed
- Trimmed for level flight



EIGHTS ON PYLONS

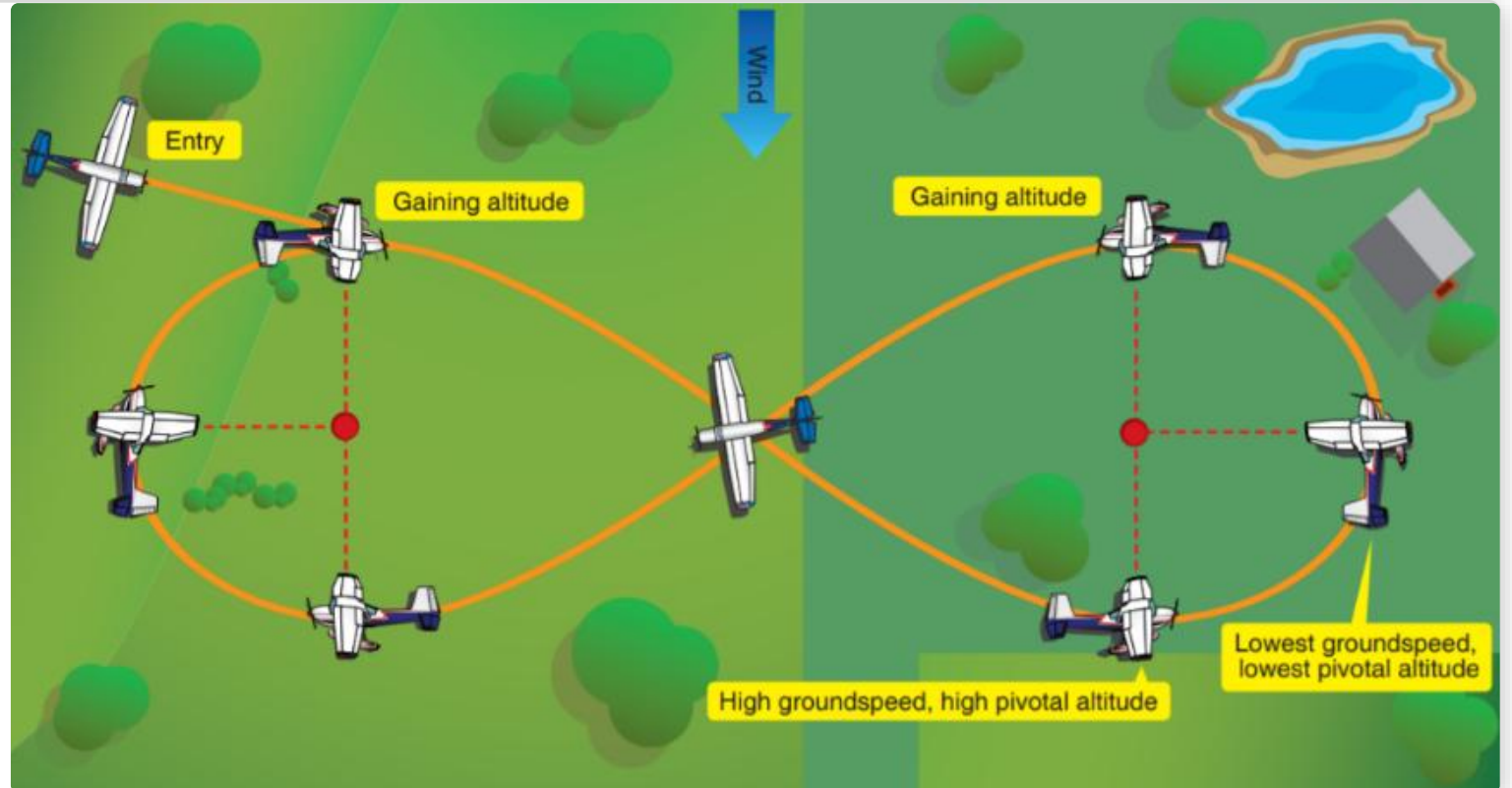
ENTRY

Fly to the midpoint of the pylons at a 45° angle to the downwind

- Highest groundspeed & PA

Roll into a 30–40° bank when the pylon is just ahead of the reference

- Place the aircraft reference at the base of the pylon



EIGHTS ON PYLONS

FIRST PYLON: 1ST HALF OF THE TURN

Highest groundspeed

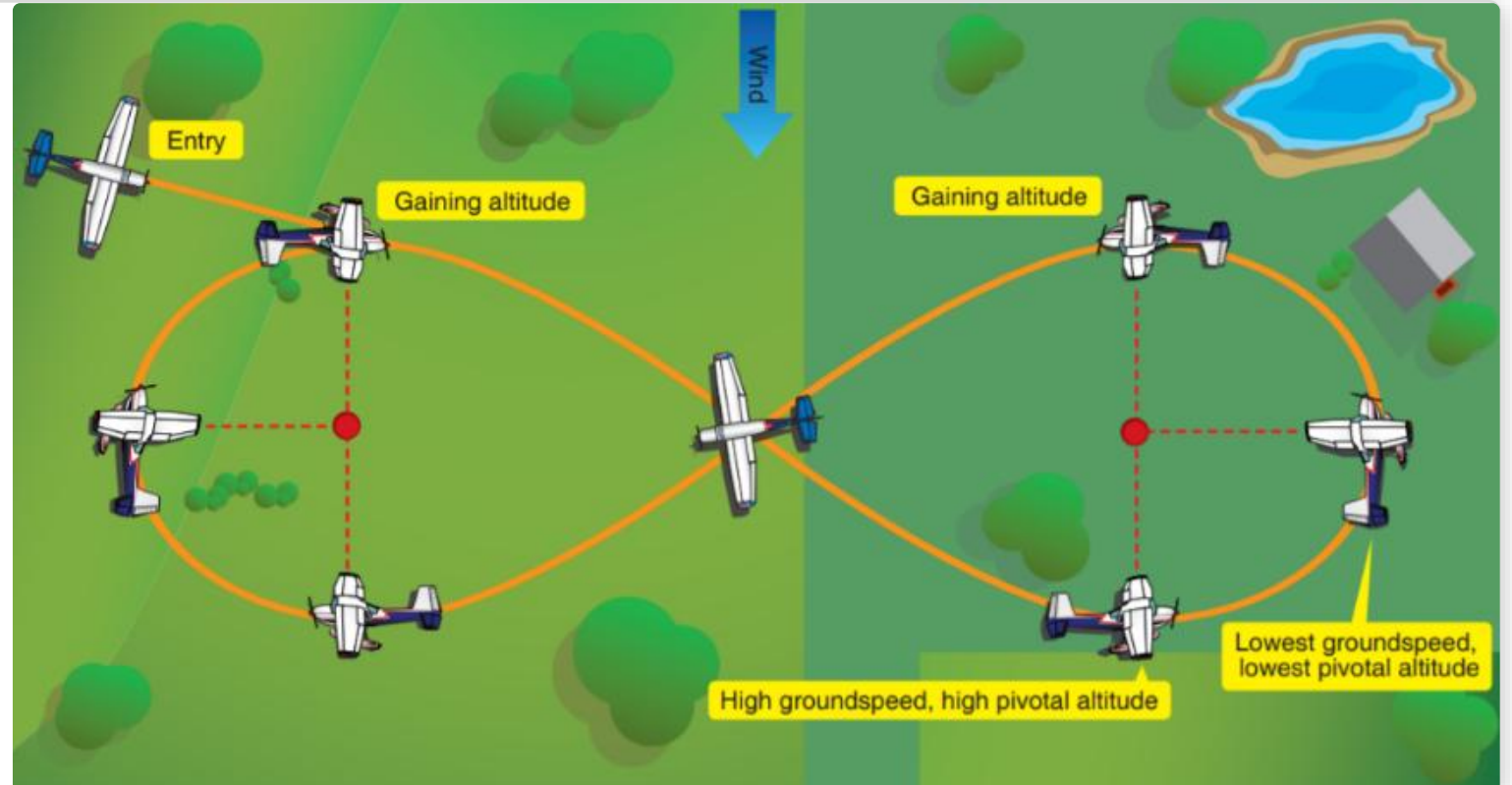
As groundspeed decreases, PA decreases

With no corrections, the pylon will move forward

- Requires forward pressure

Descend to maintain PA & the reference

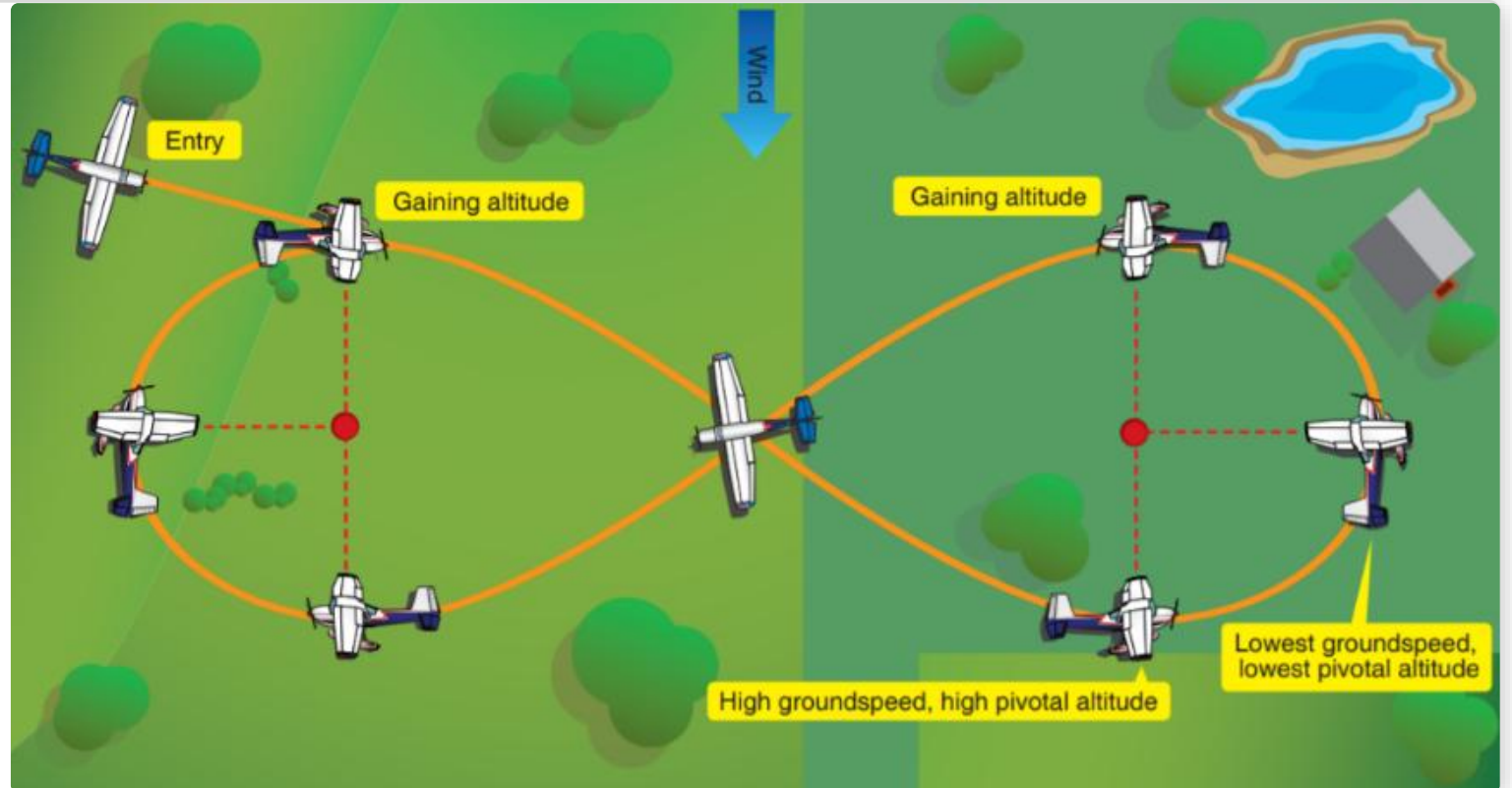
Bank decreases as wind pushes the plane away from the pylon



EIGHTS ON PYLONS

FIRST PYLON: 2ND HALF OF THE TURN

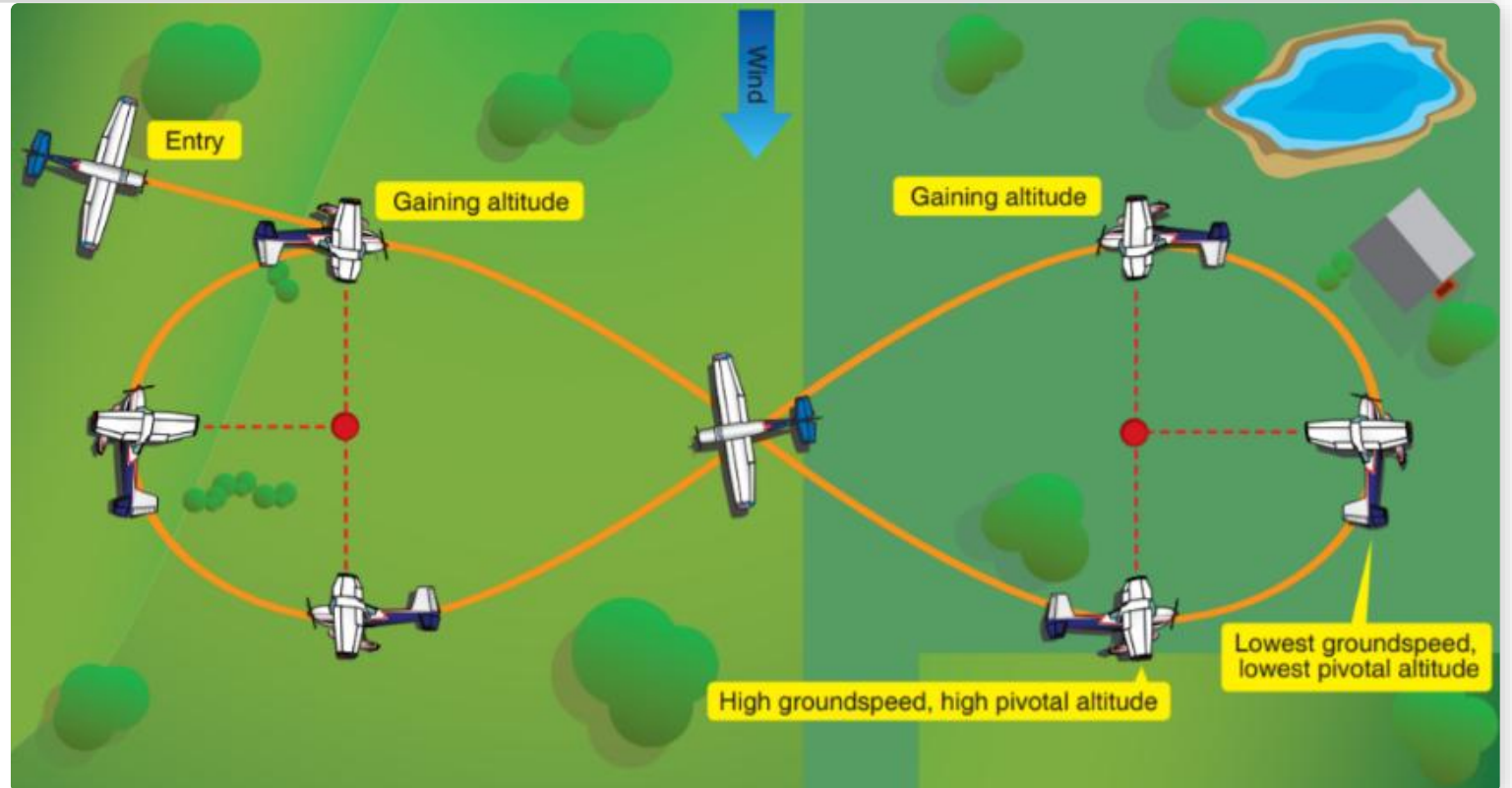
- **Groundspeed & PA increase**
- **Climb to maintain PA**
- **Backward movement = Back pressure**
- **Bank increases as wind pushes the plane closer to the pylon**



EIGHTS ON PYLONS

TRANSITION BETWEEN THE PYLONS

- Rollout to fly diagonally to a point on the downwind side of the second pylon
- Straight-&-level for 3-5 sec.
- Crab into the wind
- Turn the opposite direction as the pylon aligns with the reference



EIGHTS ON PYLONS

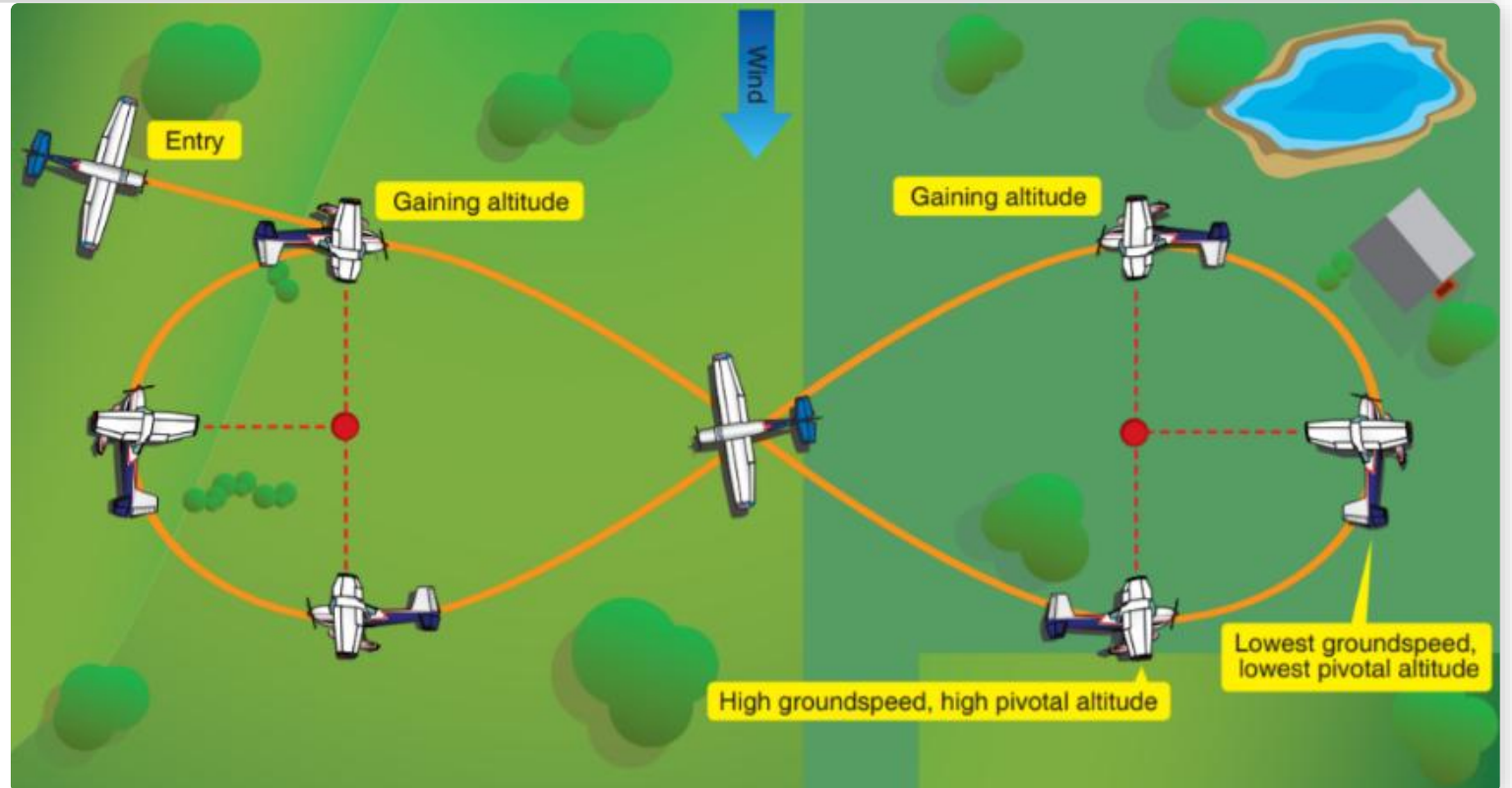
SECOND PYLON: 1ST HALF OF THE TURN

Highest groundspeed & PA

**As groundspeed decreases,
PA decreases**

- Forward movement =
Forward pressure

**Decrease bank as wind
pushes the plane away from
the pylon**



EIGHTS ON PYLONS

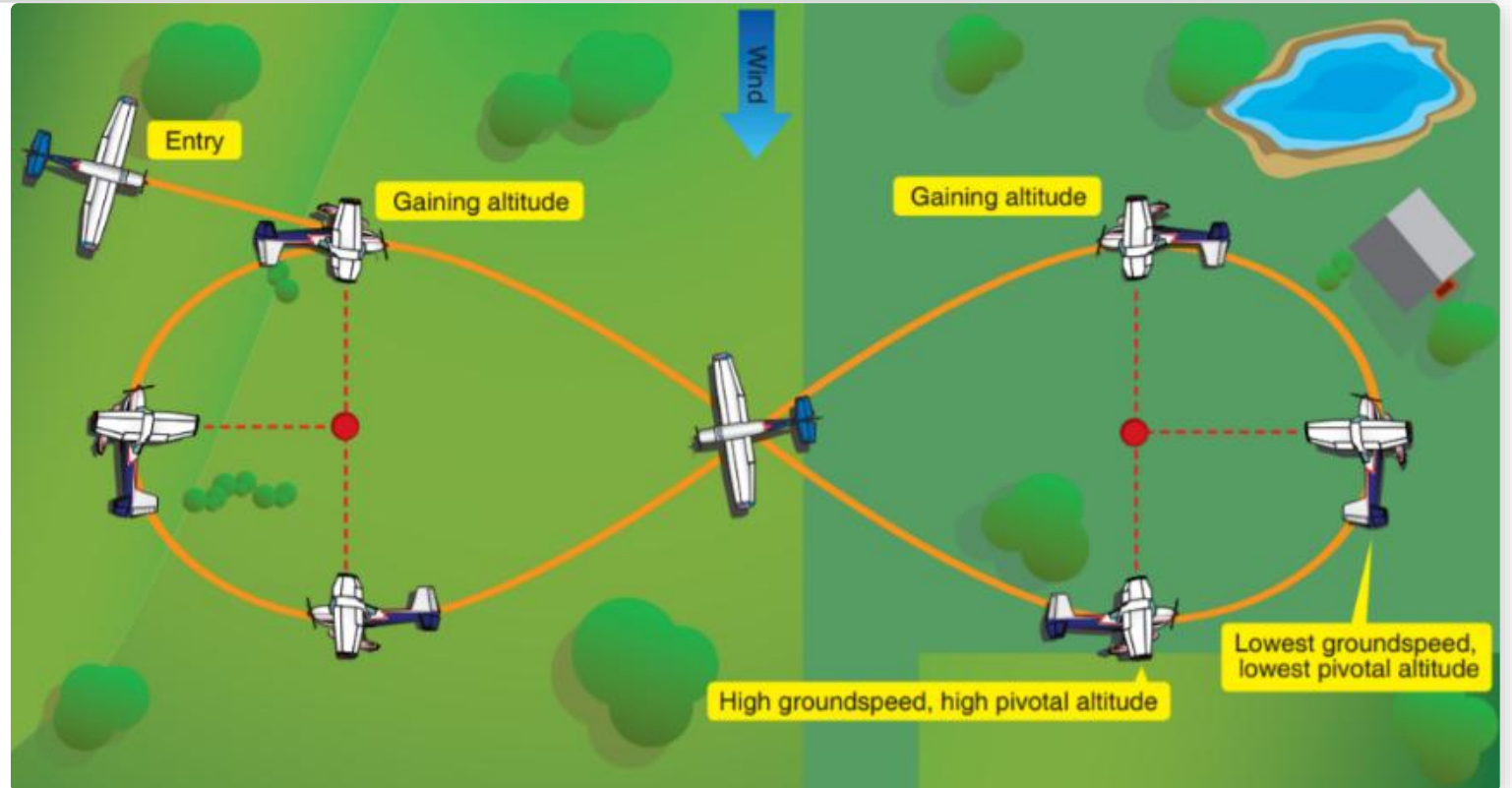
SECOND PYLON: 2ND HALF OF THE TURN

Groundspeed & PA increase

Climb to maintain the reference & PA

- Backward movement = Back pressure

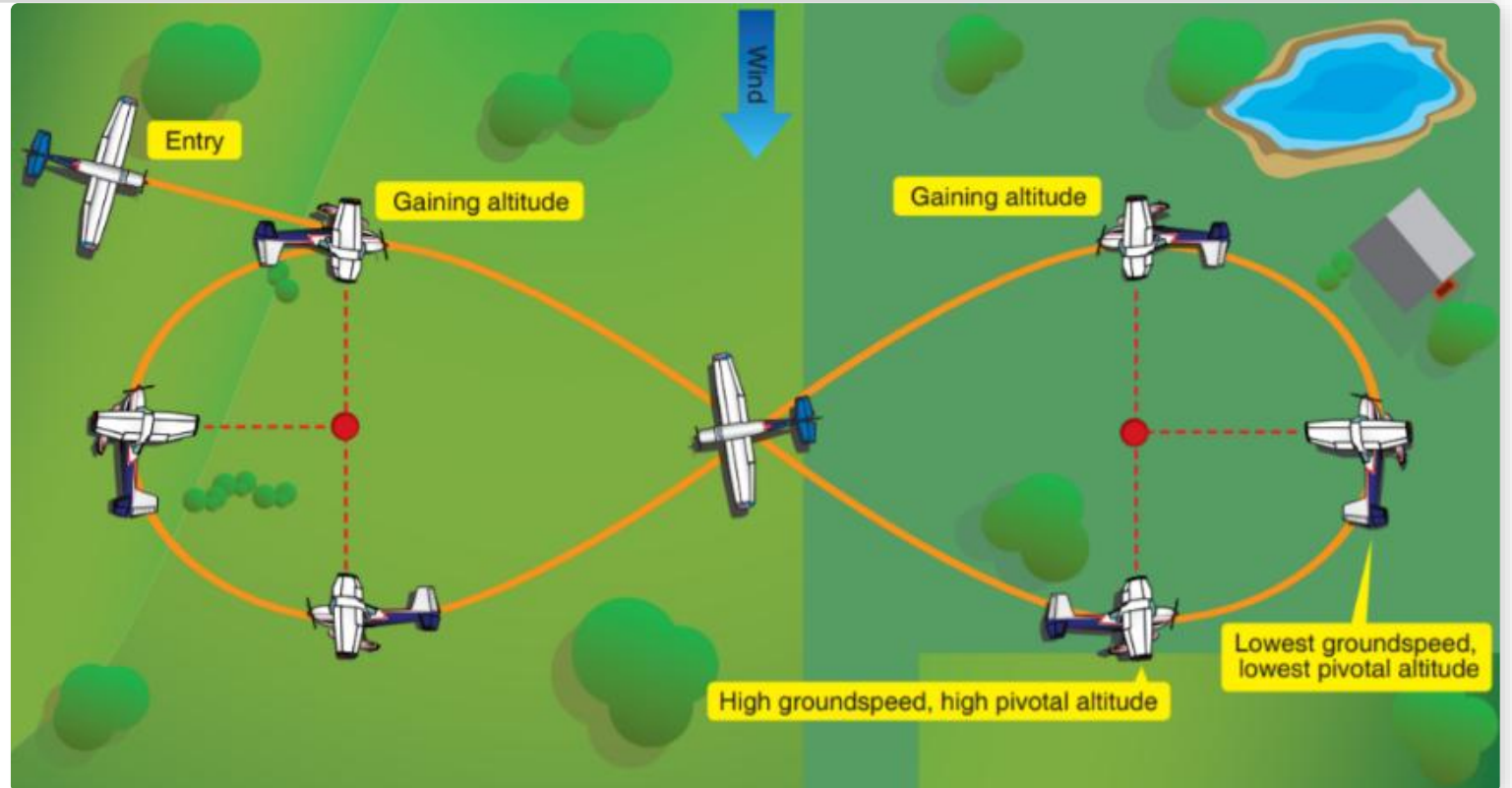
Increase bank as wind pushes the plane toward the pylon



EIGHTS ON PYLONS

EXIT

After completing a rotation around each pylon, exit on the entry heading



COMMON ERRORS

EIGHTS ON PYLONS

- **Failure to clear the surrounding area for safety hazards, initially and throughout the maneuver.**
- **Skidding or slipping in turns**
- **Excessive gain or loss of altitude**
- **Poor choice of pylons**
- **Not entering the pylon turns into the wind**



COMMON ERRORS

EIGHTS ON PYLONS

- **Failure to assume a heading when flying between pylons that will compensate sufficiently for drift**
- **Failure to time the bank so that the turn entry is completed with the pylon in position**
- **Abrupt control usage**
- **Inability to select pivotal altitude**





HAZARDS



HAZARDS

DIVISION OF ATTENTION

Crosscheck should focus on outside references with glances to the instruments

- Build good habits early
- Don't fixate
- Be proactive in making corrections to maintain altitude & airspeed

Divide attention between control & orientation

- Orientation: Attitude & position in space (airspace, terrain, traffic etc.)



HAZARDS

DISTRACTIONS

They're dangerous

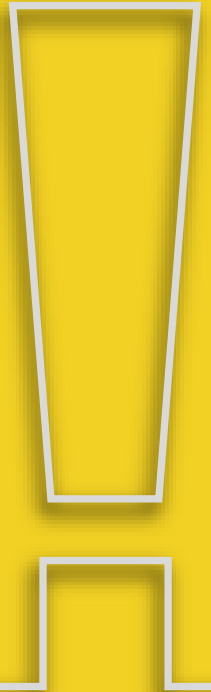
- Remove them from view
- If it's a person, explain the situation & ask them to stop

Focus on aircraft performance and clear for traffic

- If distracted, recognize the problem, and fix it
- Safety first

Aviate, Navigate, Communicate

- Focus on flying



HAZARDS

SA & DISORIENTATION

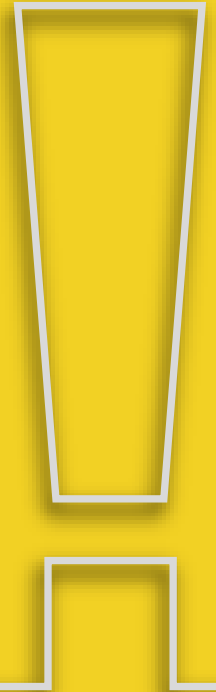
Extremely important, lost SA has led to accidents

Maintain Situational Awareness & Orientation

- Know where you are, what's coming next, & stay ahead of the airplane
- Be aware of other traffic
- If SA or orientation is lost, admit it, and fix it

Disoriented: Get to a safe attitude, airspeed, and altitude

- In the case of an upset: Push, Roll, Thrust, Stabilize



HAZARDS

TASK PRIORITIZATION

Divide attention between the aircraft, scanning, and communicating

- No responsibility should take full attention for more than a short period

Understand what needs to be accomplished and when

- Use standard operating procedures & checklists

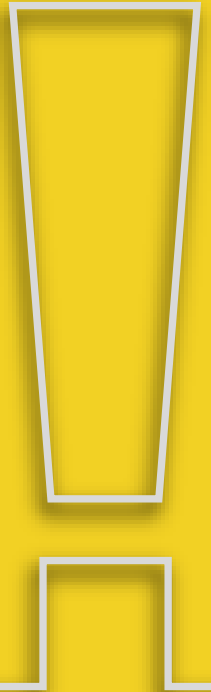
Recognize when you're behind and find a way to catch up

- "Attack the closest alligator"



Safety first!

- Aviate, Navigate, Communicate



HAZARDS

LOW ALTITUDE MANEUVERING

Small problems at high altitude can be big problems at low altitude

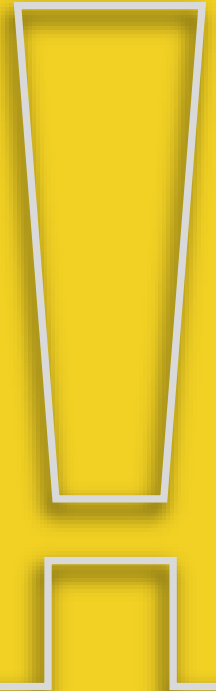
Avoid quick, panicked maneuvering

Low Altitude Stall/Spin

- Little to no recovery time
- Maintain coordination and airspeed
- Recover at any indication of a stall and climb to a safe altitude

Spins

- Combination of stall + yaw
- Maintain coordination & airspeeds, use smooth control pressures



HAZARDS

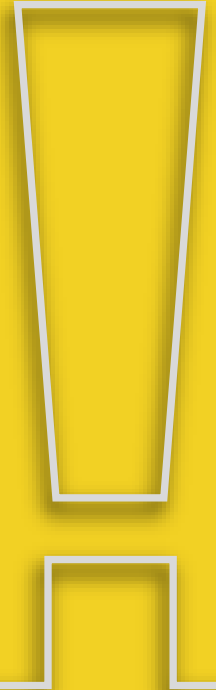
LOW ALTITUDE MANEUVERING

Controlled Flight into Terrain

- Avoidance starts on the ground with proper planning and decision making

Recommendations

- Don't attempt to fly into IMC
- Fly above minimum safe altitudes
- Verify proper altitude
- Verify ATC clearances
- Maintain SA vertically and horizontally
- Comply with appropriate regulations
- Be extra cautious in unfamiliar areas
- Use current charts & reference all available information
- Use appropriate checklists
- Know your aircraft & its equipment





HAZARDS

COLLISION HAZARDS

COLLISION AVOIDANCE

Scanning

- Series of short regularly spaced eye movements

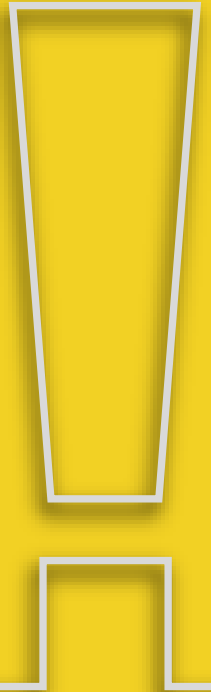
Clearing Procedures

- Clear prior to and during every maneuver
- Clearly communicate intentions & location in practice areas

Operation Lights On

- Turn on landing lights during takeoff & below 10,000' MSL

Right-of-Way Rules





HAZARDS

COLLISION HAZARDS

TERRAIN

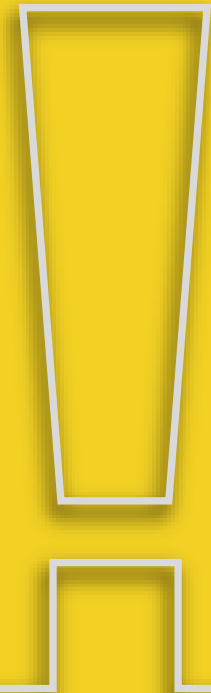
Be aware of hazardous terrain around the airfield

Study the Charts

- Terminal charts & chart supplement
- IFR/VFR chart altitudes
- Use Maximum Elevation Figures and other data

Minimum Safe Altitudes

- Anywhere: Altitude allowing emergency landing without undue hazard
- Congested: 1,000' above the highest obstacle within 2,000'
- Uncongested: 500' from the surface
- Water/Sparsely Populated: 500' from people/property





HAZARDS

COLLISION HAZARDS

OBSTACLES & WIRE STRIKES

Be familiar with any obstacles nearby airports

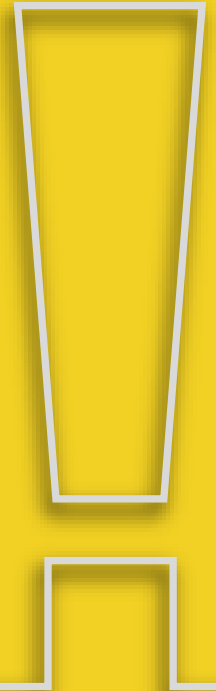
- NOTAMs & Terminal Procedures

Antenna Towers

- Can extend over 1,000' to 2,000' AGL
- Supporting guy wires can extend 1,500' horizontally

Overhead Wires

- Transmission lines often span departures and landmarks pilots follow
 - Lakes, highways, railroad tracks, etc.
 - May not be lighted





QUESTIONS?

