Private Pilot (ASEL) Ground School Course

Lesson 13 | Airport Operations

Lesson Overview

Lesson Objectives:

- Develop knowledge and a working understanding of airport traffic patterns.
- Develop understanding of basic radio communications.
- Understand the hazards of wake turbulence and runway incursions.

Lesson Completion Standards:

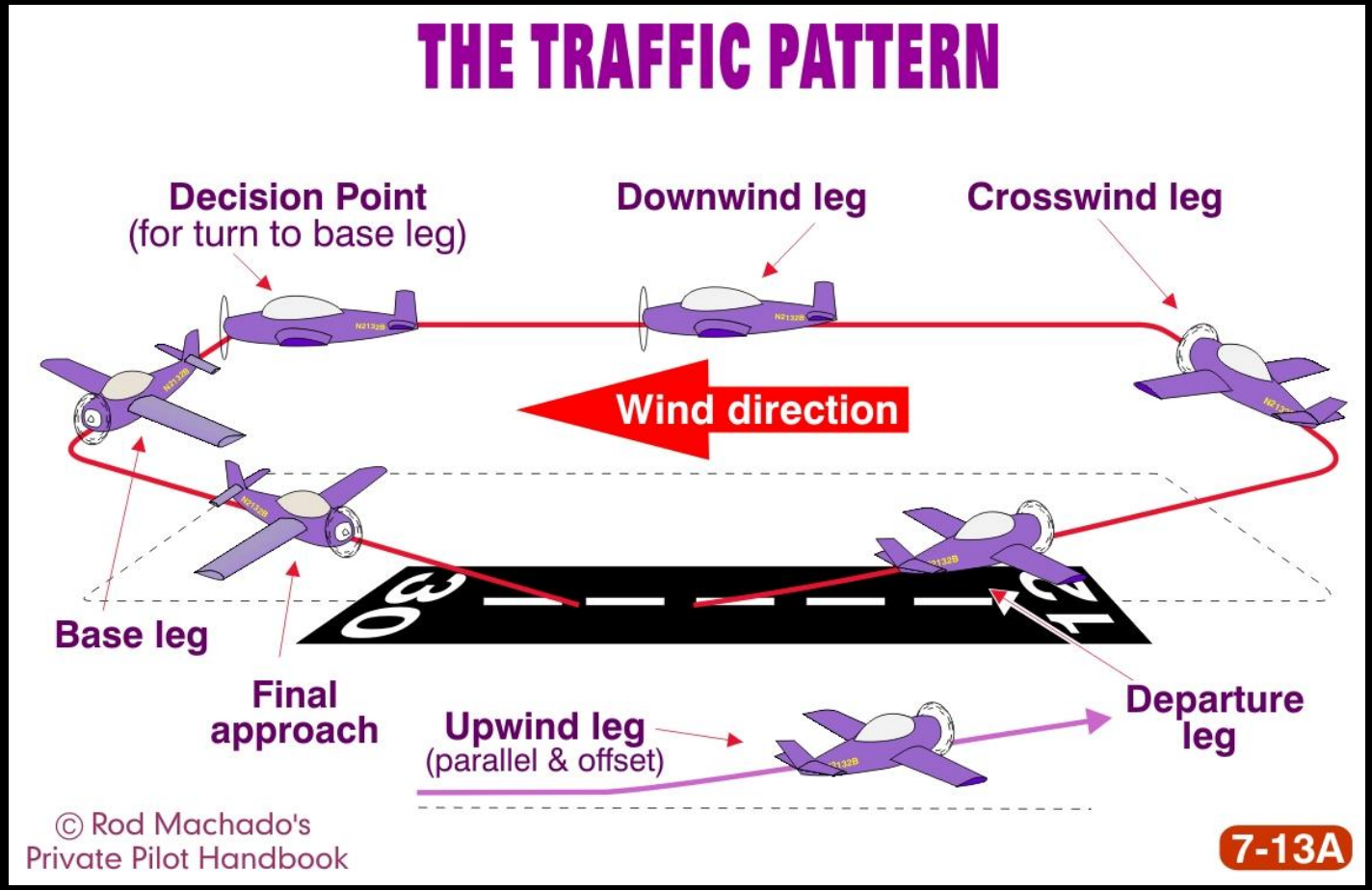
- Student demonstrates satisfactory knowledge of airport operations by answering questions and actively participating in classroom discussions.

Traffic Pattern

Airport Operations

Traffic Pattern

- All airports have traffic patterns
- Patterns ensure a safe order on the flow of traffic at airports
- Normally rectangular in shape with each portion having a specific name



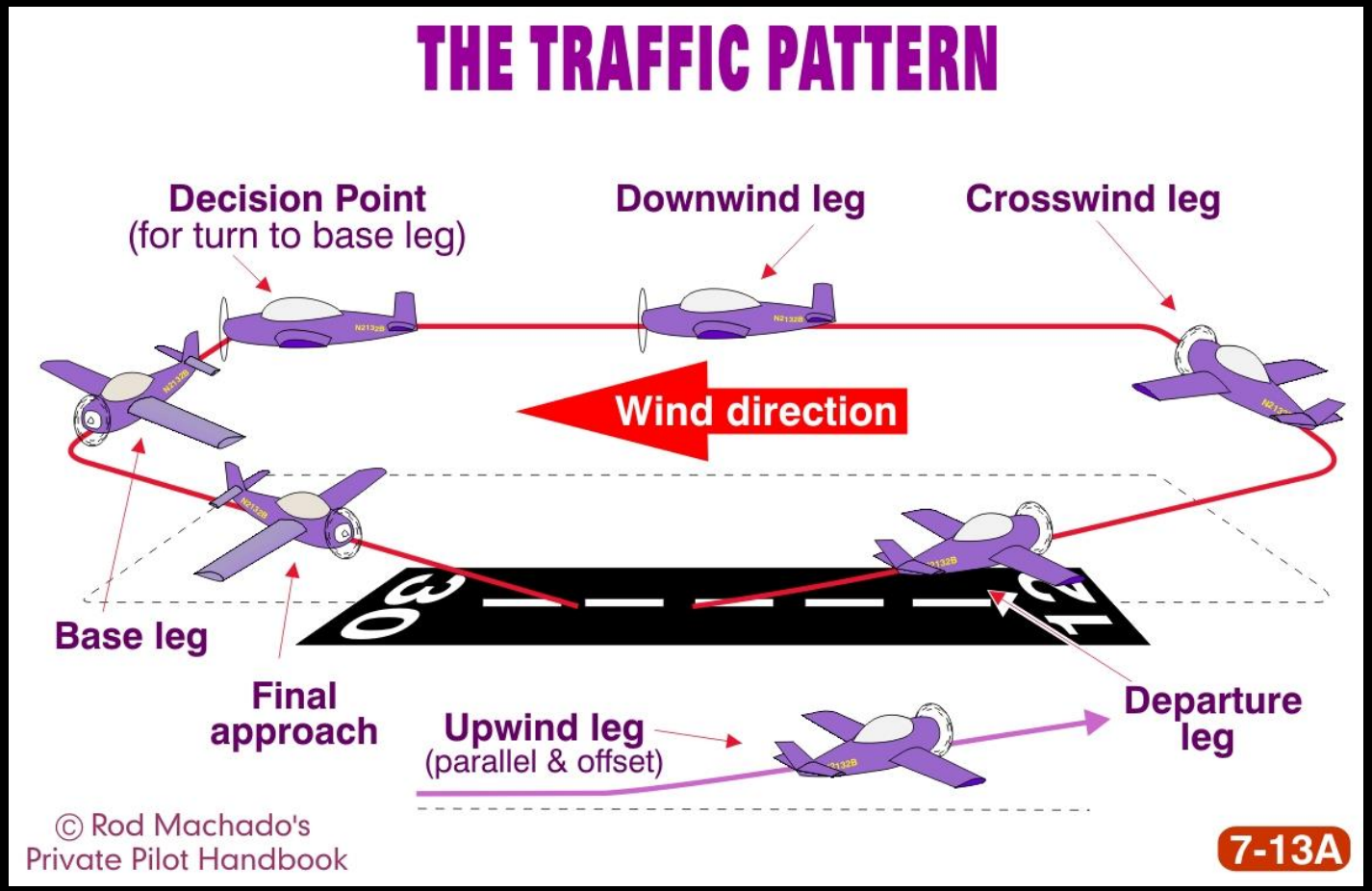
The Traffic Pattern

- At tower-controlled airports, air traffic controllers manage the flow of aircraft
- Pilots fly the established traffic pattern while controllers verbally direct them into an orderly sequence

The Traffic Pattern

- At nontowered airports, pilots fly the airport's traffic pattern on their own
- They decide their landing direction and sequence among other aircraft in the pattern
- The traffic pattern represents a very standardized way for pilots to depart from or land at an airport
- Traffic patterns are, unless posted otherwise, made with a series of left turns

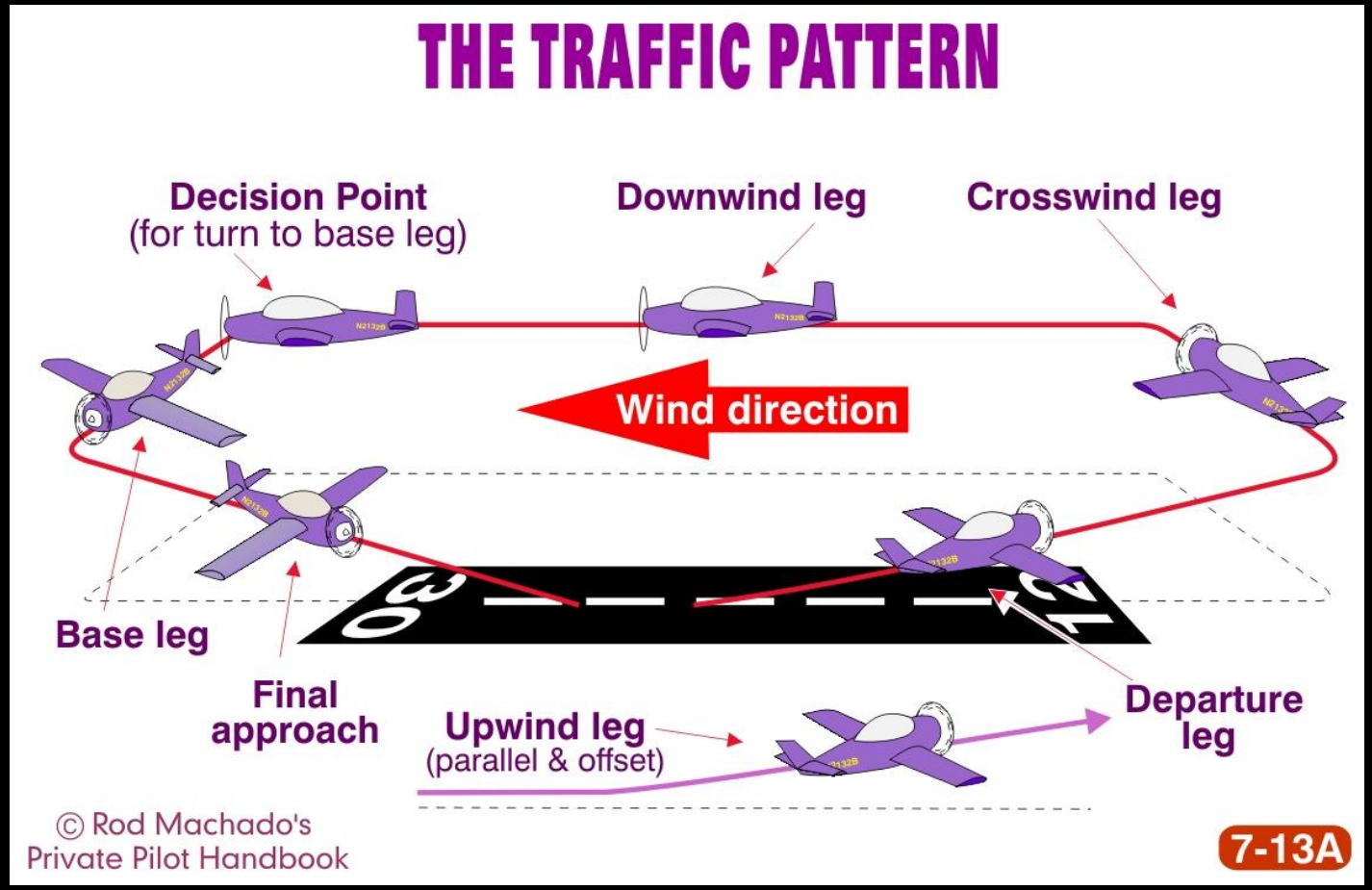
Traffic Pattern



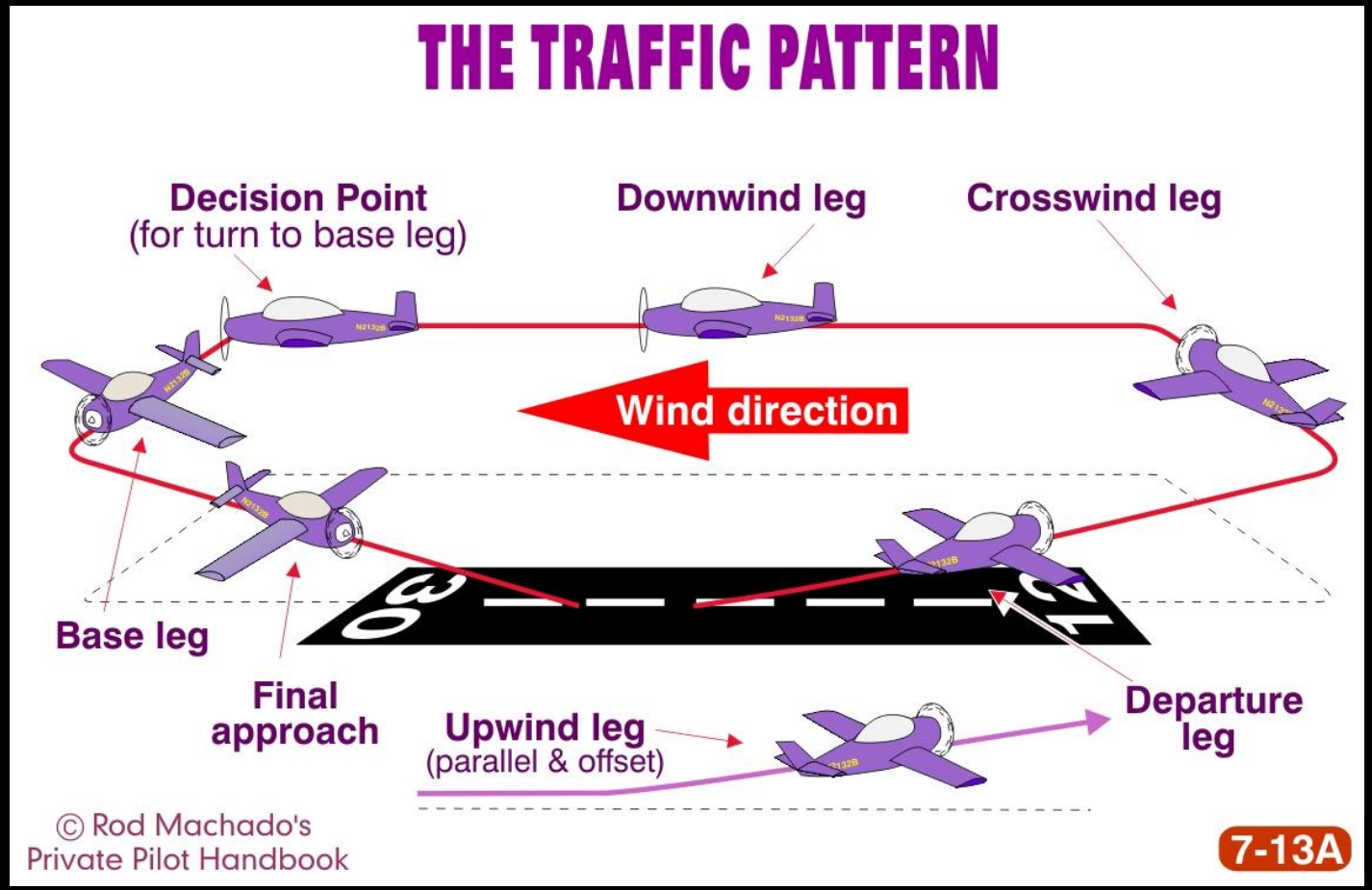
- Rectangular in shape consisting of six segments:
  - Departure leg
  - Crosswind leg
  - Downwind leg
  - Base leg
  - Final approach
  - Upwind leg

Departure Leg

- Takeoffs are made into the wind
- Takeoff flight path is the departure leg
- After takeoff aircraft either depart the airport traffic area, or remain in the pattern



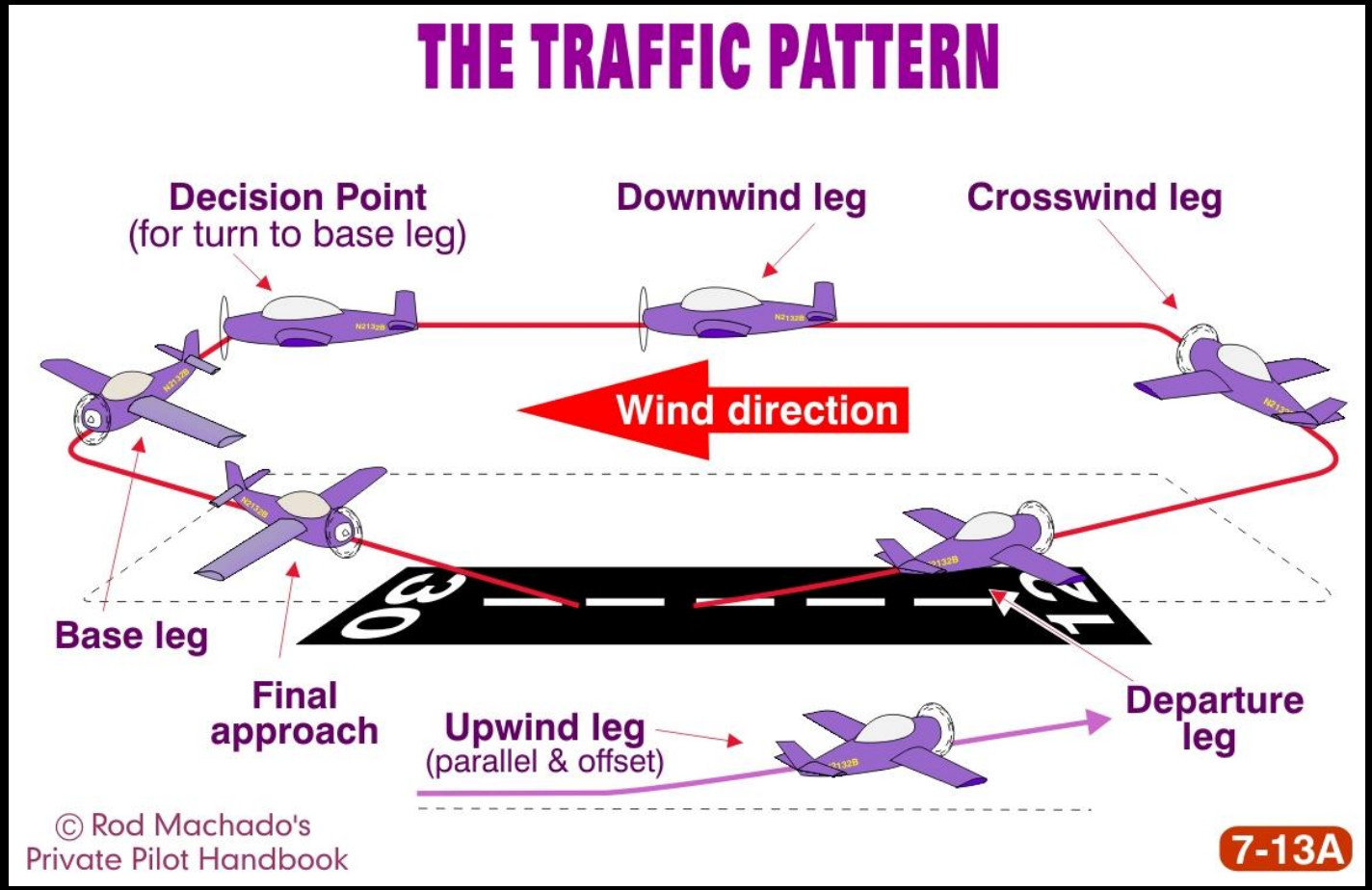
Crosswind Leg



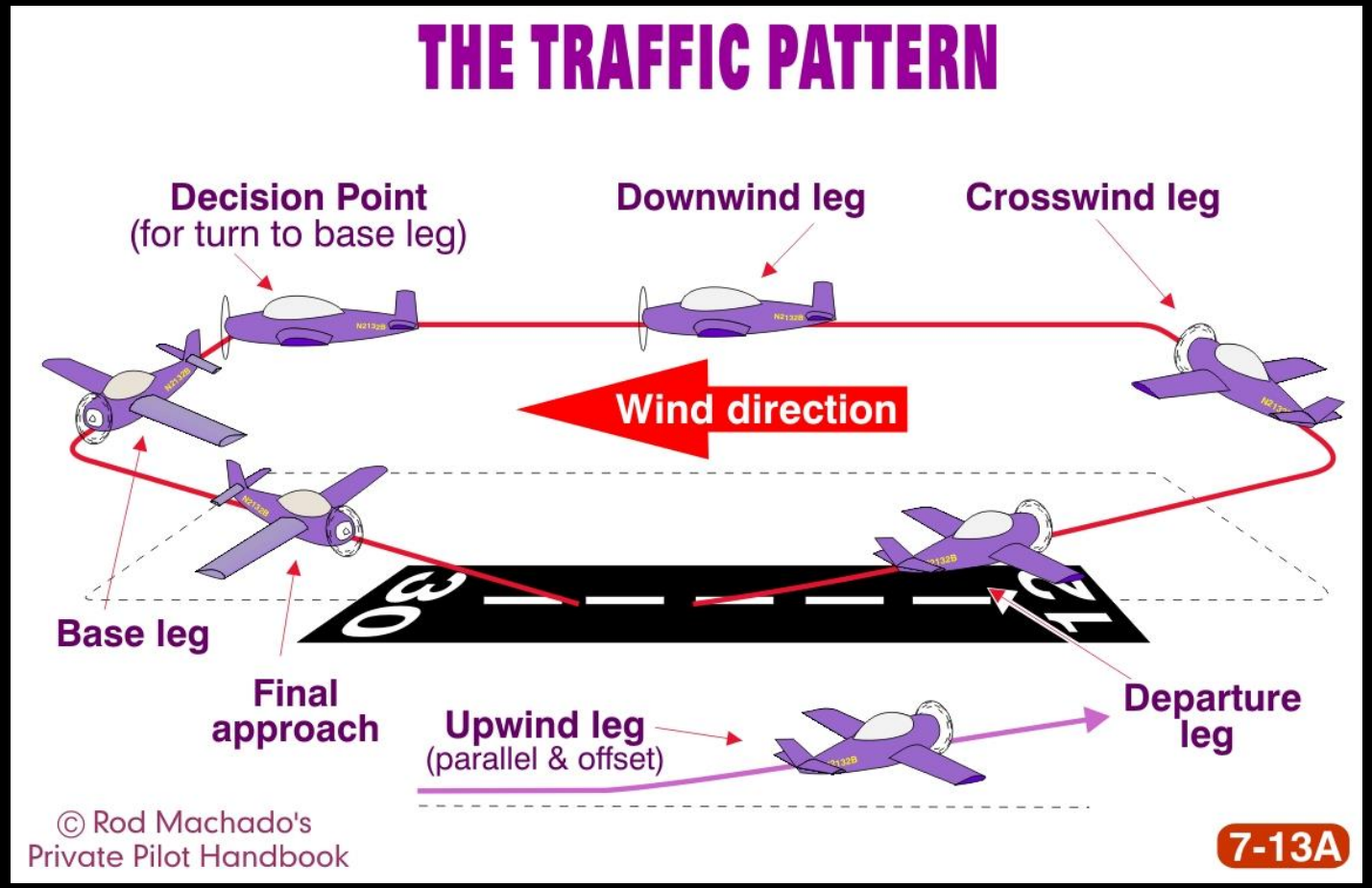
- A turn (generally a left turn) to the crosswind leg is made when the airplane is beyond the departure end of the runway and within 300 feet of the traffic pattern altitude
- Note: Traffic pattern altitude is typically 1000 feet AGL

Downwind Leg

- Continuing climb, another 90° turn is made onto the downwind leg
- The airplane is parallel to the runway and traveling opposite to the direction of landing
- Leg is flown 1/2 to one mile out from the landing runway



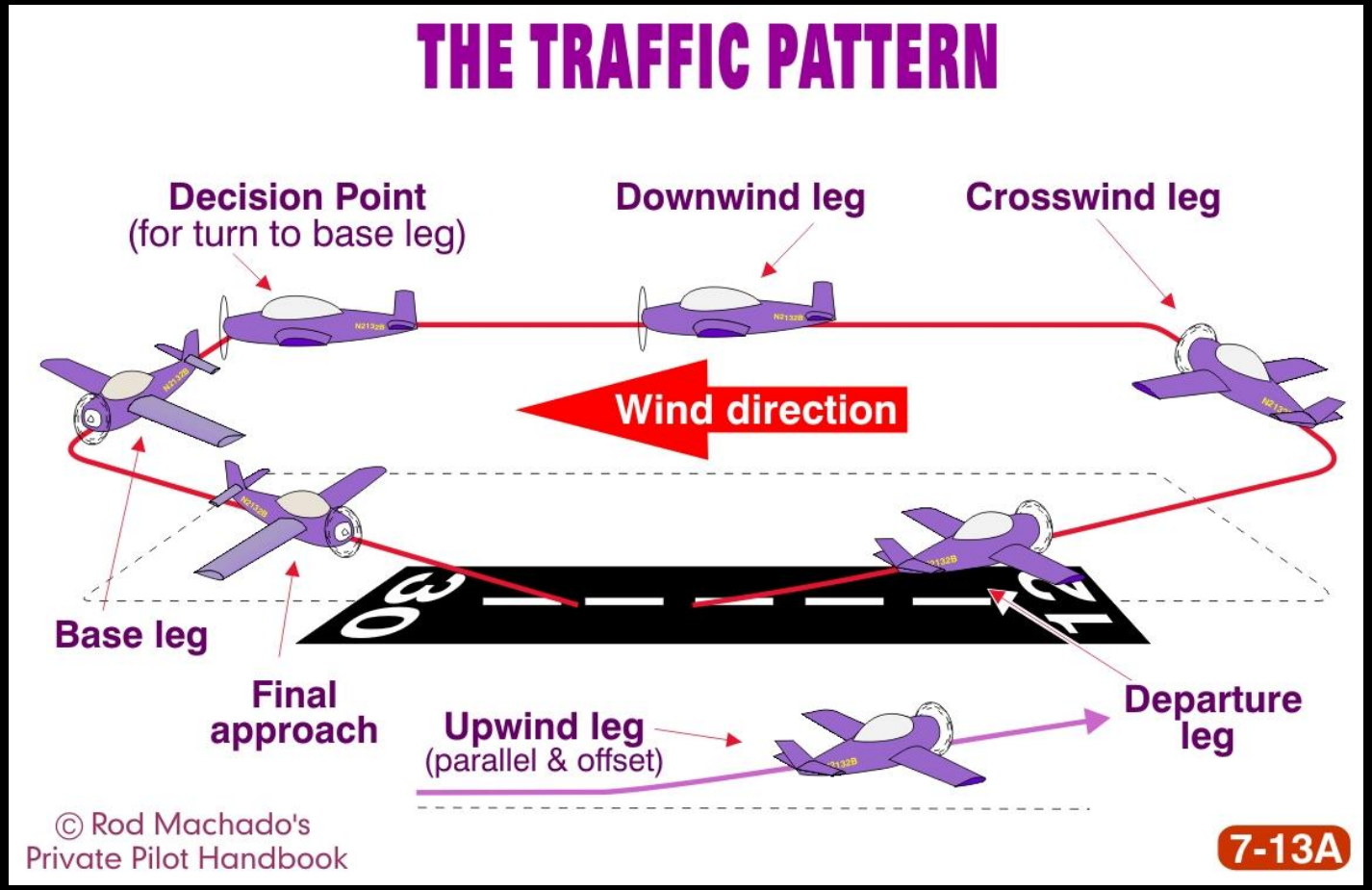
Base Leg



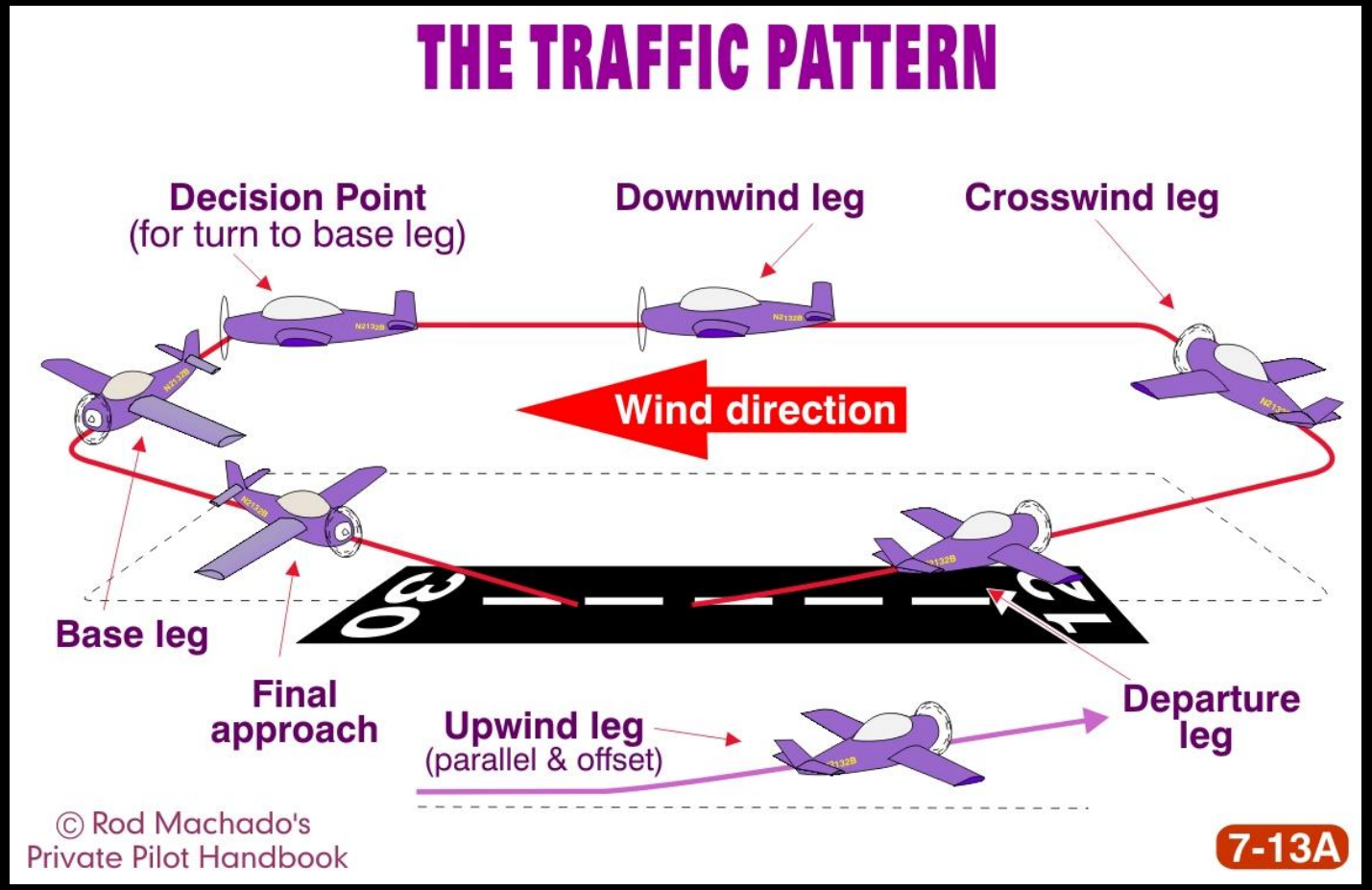
- Continue downwind until passing a decision point for turn to base leg
- Make another 90° turn onto base leg

Final Approach

- Make one more 90° turn onto final approach



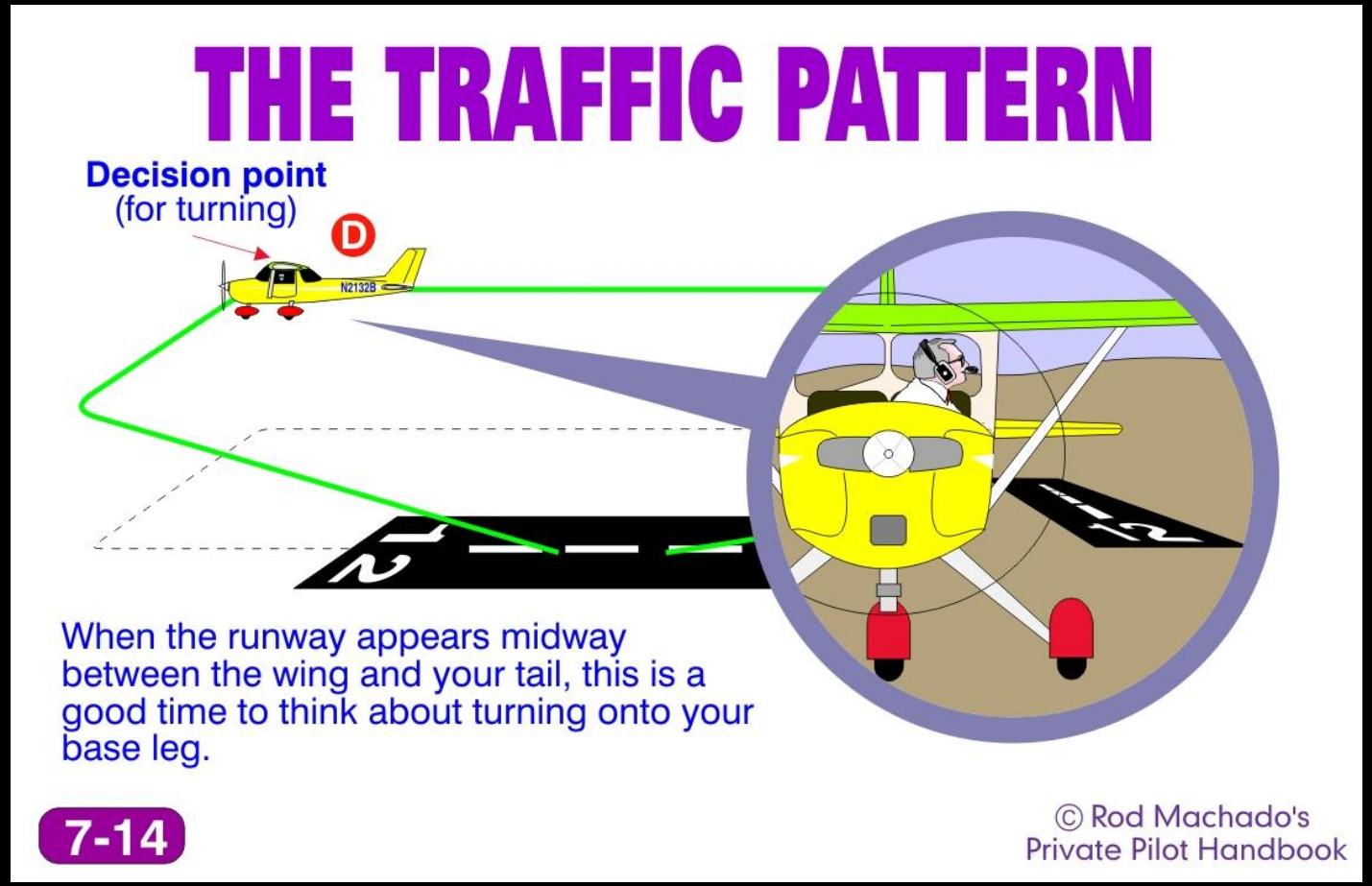
Upwind Leg



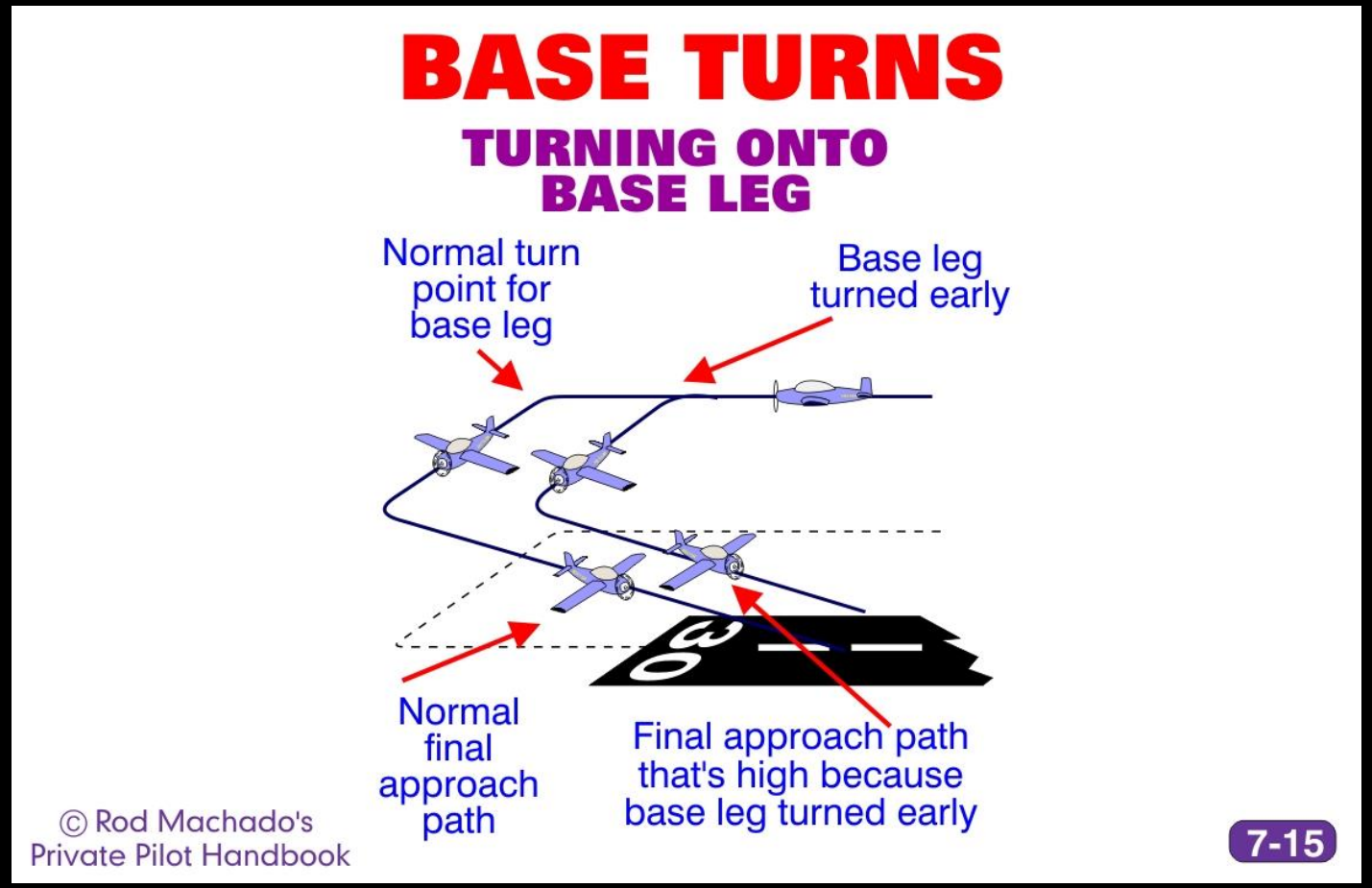
- Flown parallel to the runway in the direction of landing
- Used during go-arounds or overflights to avoid departing traffic

Turning Onto Base Leg

- Start turn onto base leg when landing threshold appears 45° between the wing and the tail of your airplane
- Provides a symmetrical, rectangular-type pattern and gives you enough distance from the runway to make a comfortable approach



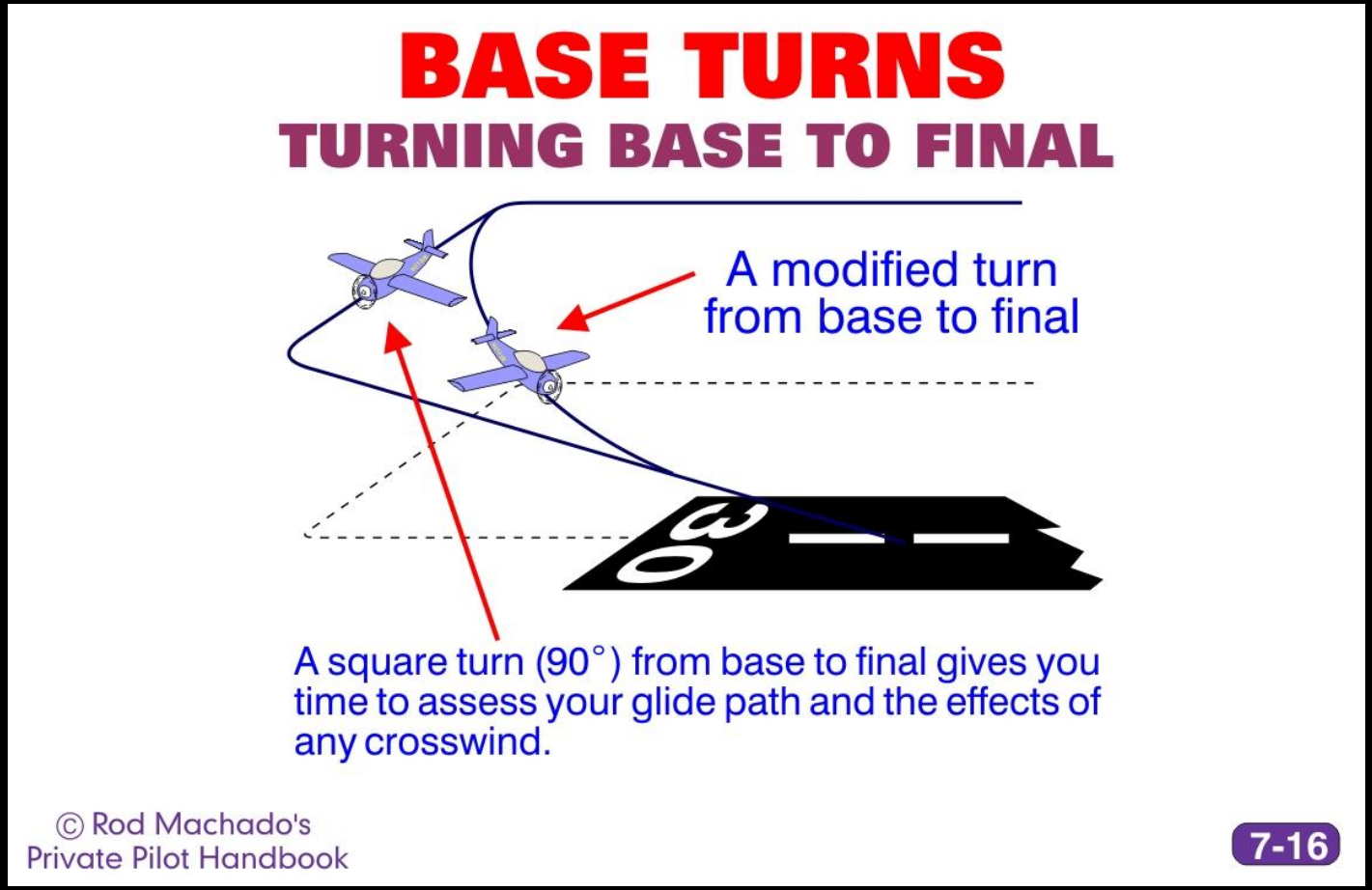
Base Leg Turns



- Base leg is a point of transition for landing
- Adjustments are made in the airplane's speed and landing configuration
- Avoid turning base too early

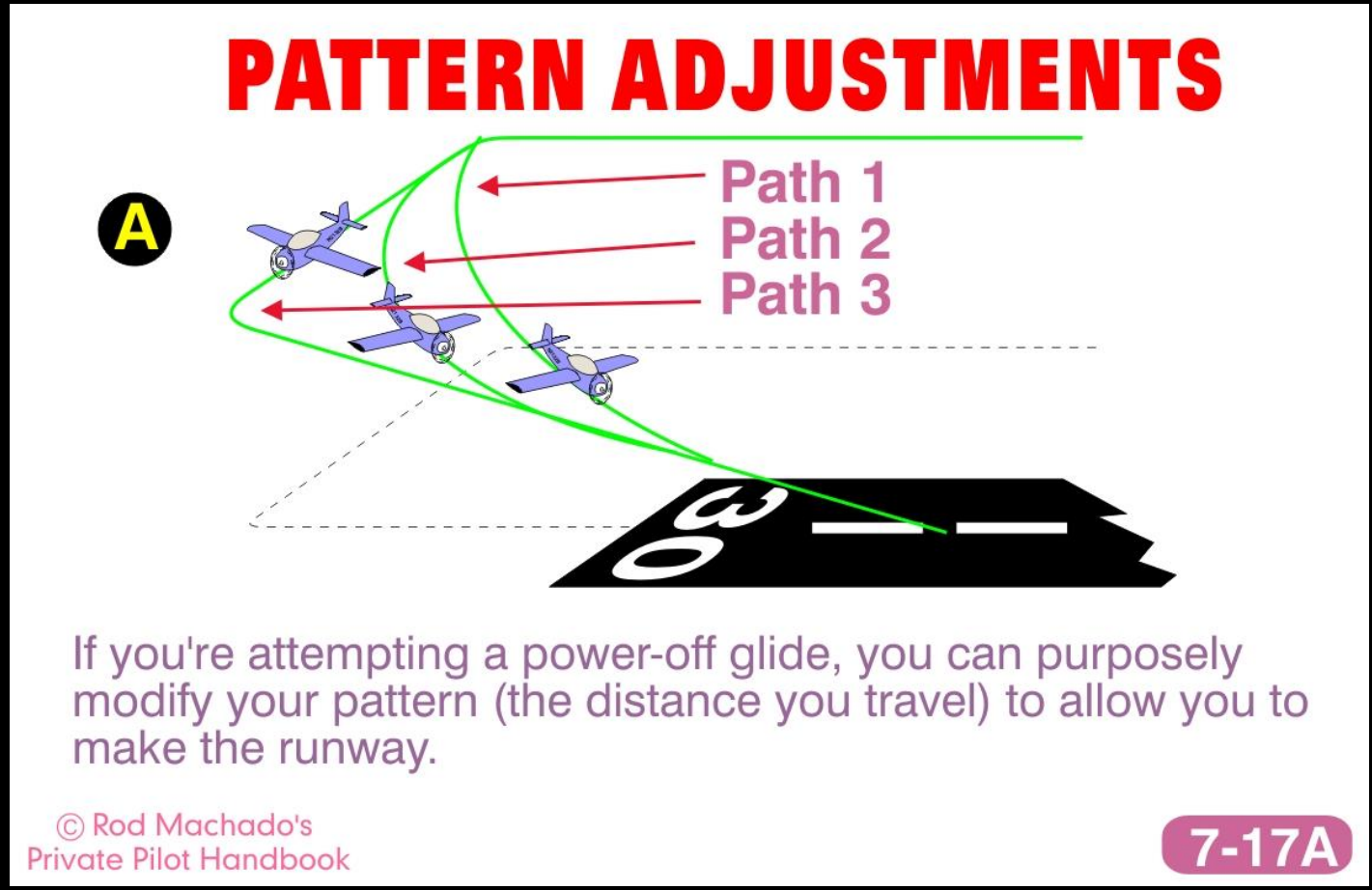
Turning Base To Final

- Provides time to observe airplane's descent path and alignment with the runway



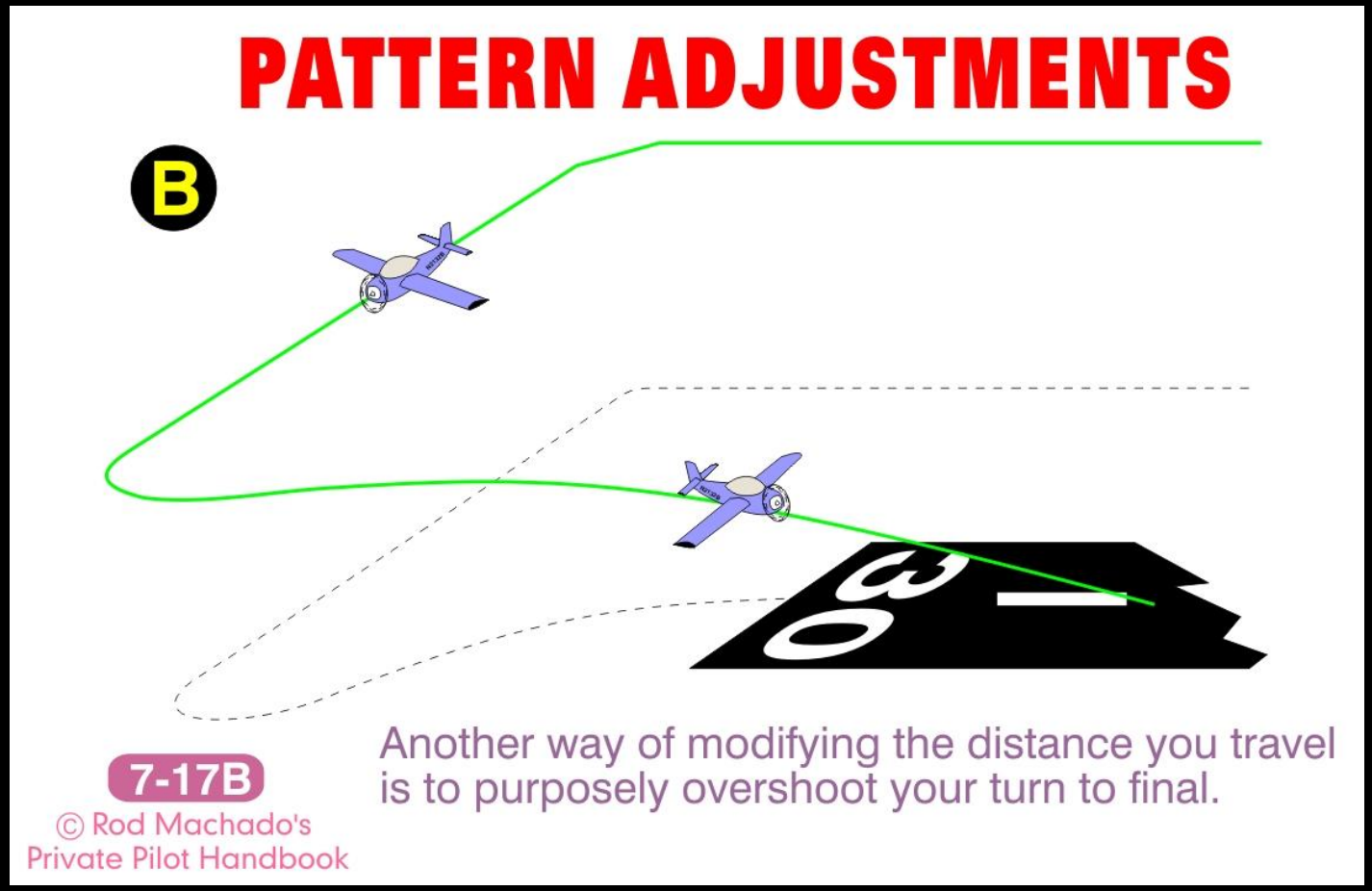
Too Low

- Turn early from the base leg to final approach
- Path 1 allows you to fly less distance during the descent
- Path 2 is longer
- Path 3 is a square turn onto final

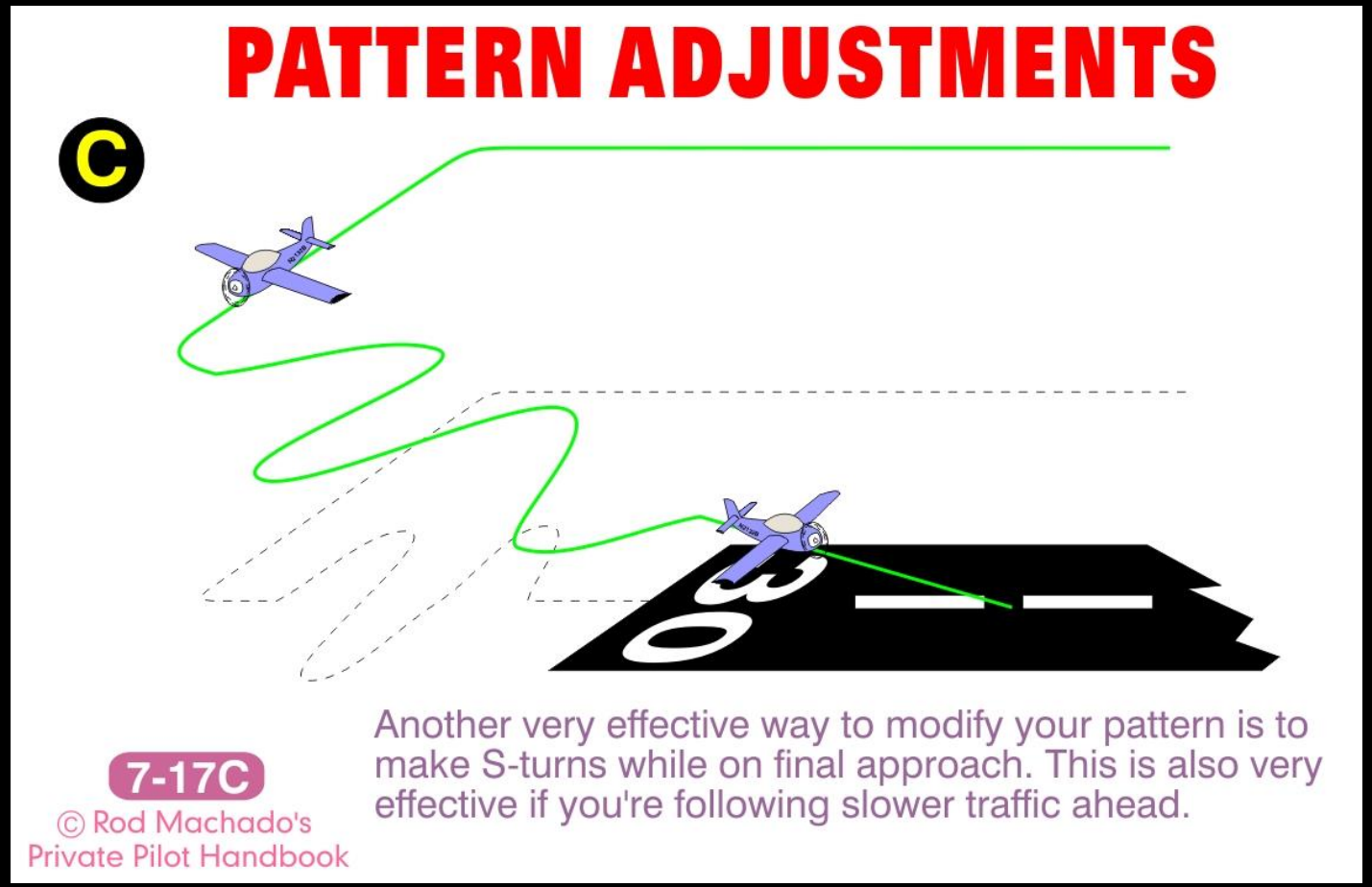


Too High

- Gives you more distance to cover during your descent



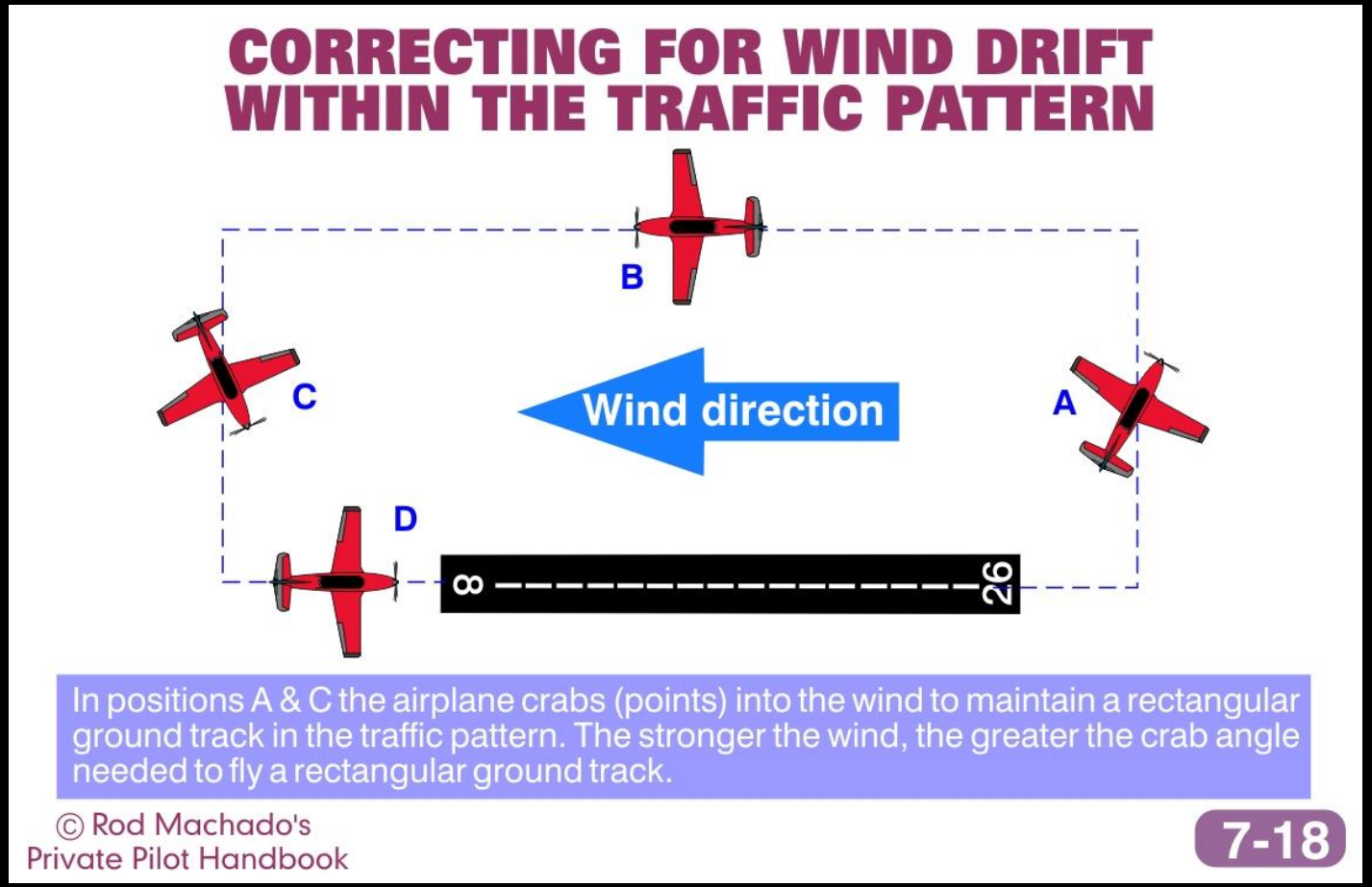
Too High



- S-turns are a series of alternating turns left and right of the direct glide path.
- Shortest distance between any two points is a straight line
- Anything you do to fly other than a straight line lengthens the path
- S-turns, coupled with forward slips and use of flaps, provide several ways of adjusting your glidepath

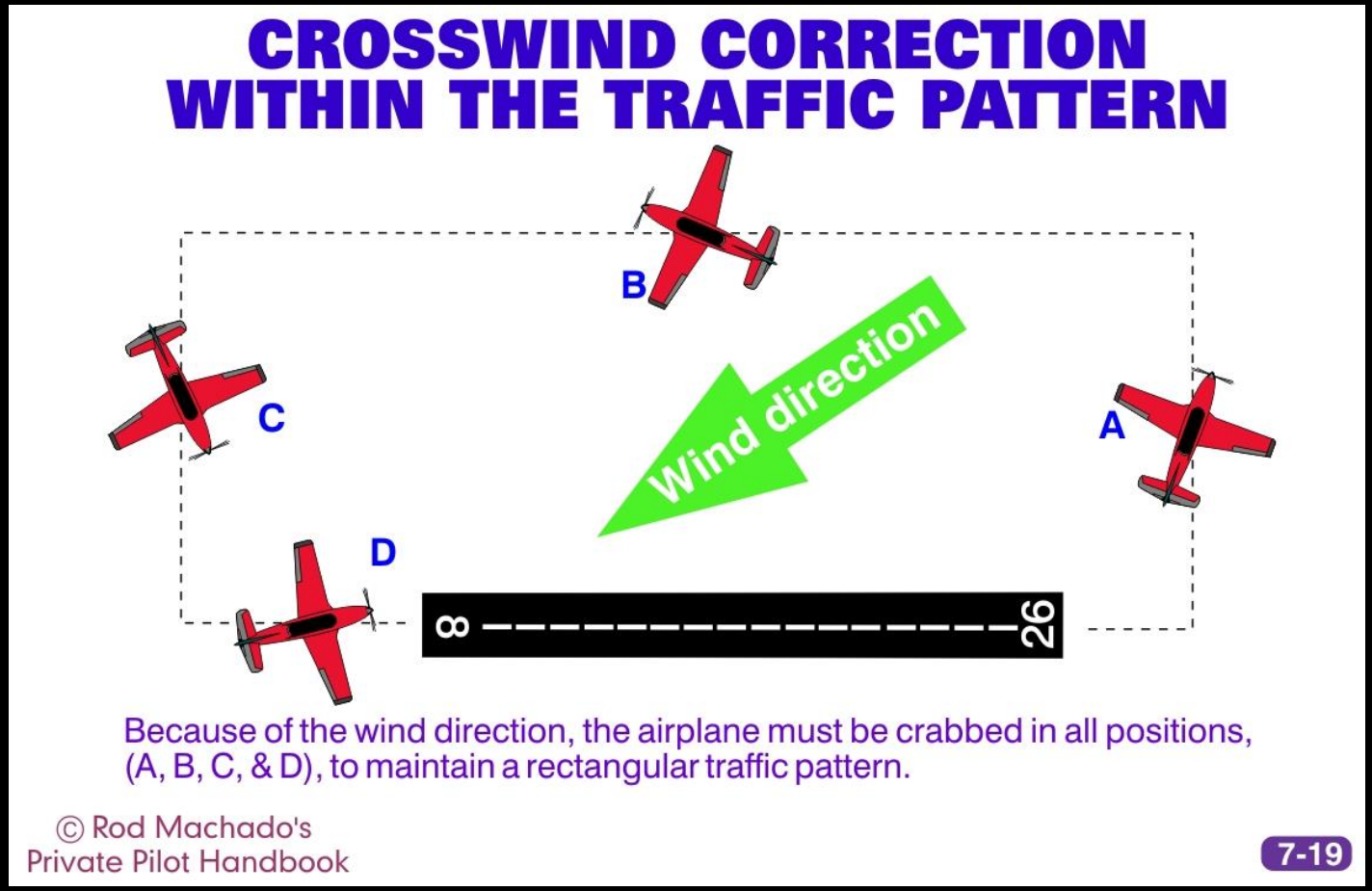
Crabbing in the Pattern

- The path the airplane traces over the ground is its ground track
- The airplane will be pushed around by the wind
- The actual aircraft track will depend on wind direction and speed



Crabbing in the Pattern

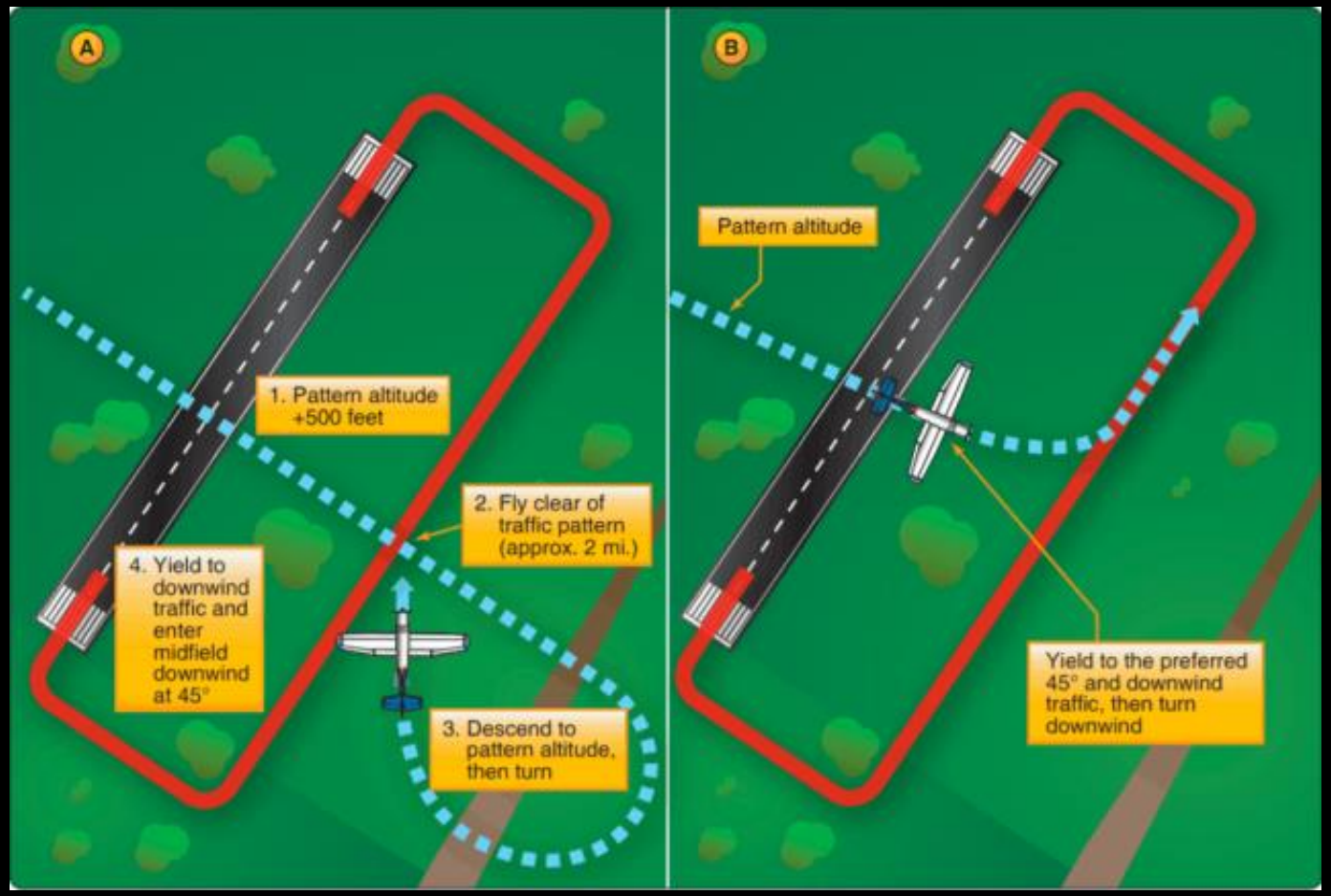
- Other pilots and the tower expect you to fly a traffic pattern that tracks straight on each leg
- Crabbing to take account of the wind is the only way to do it



Entering the Traffic Pattern

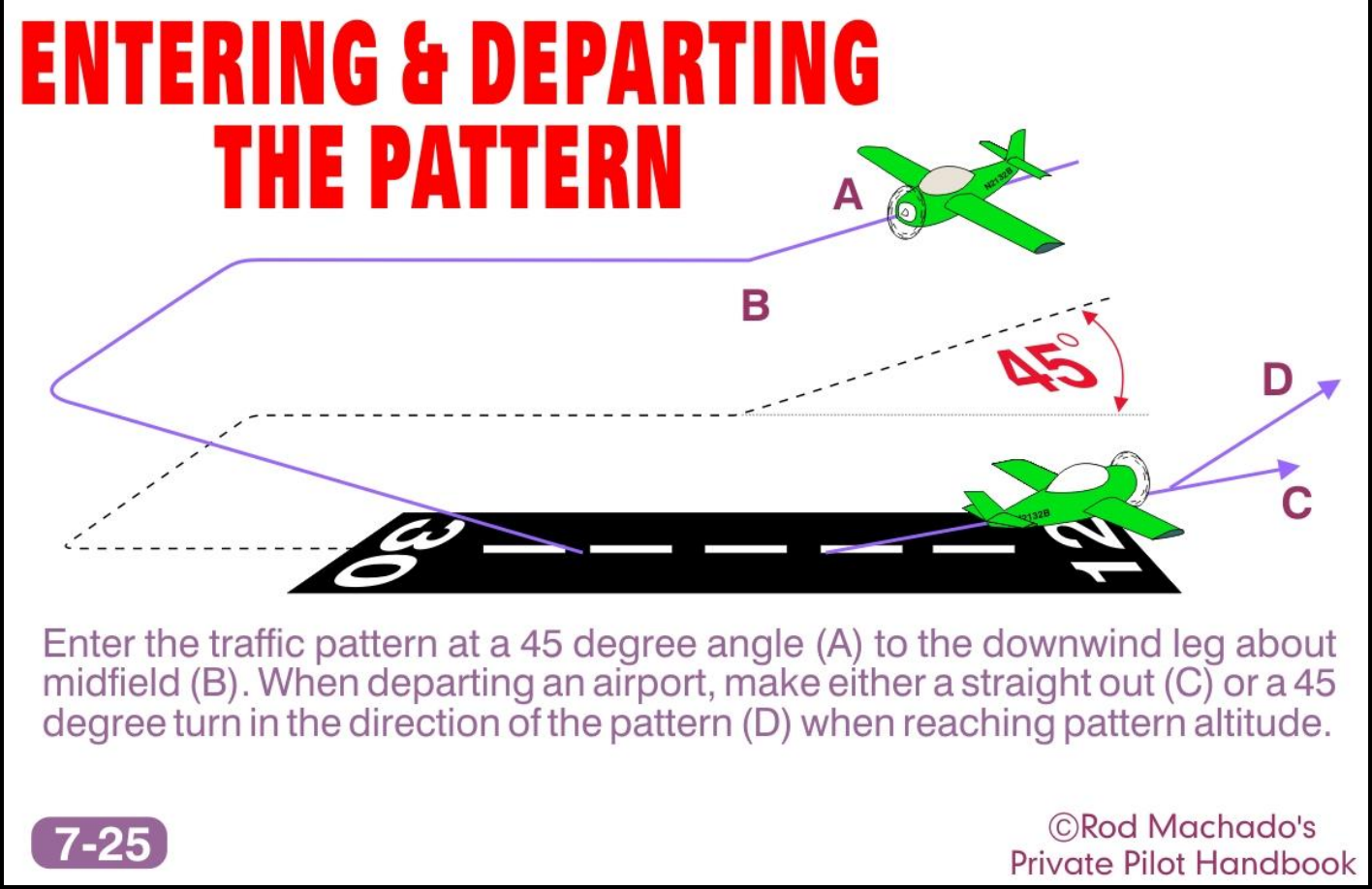
- Before entering the traffic pattern at uncontrolled airports, you are expected to observe the flow of traffic and conform to the traffic pattern in use
- You need two pieces of information in order to determine the traffic pattern: The runway in use, and the direction of turns in the pattern (left or right traffic)
- The runway in use is normally determined by the wind direction
- With rare exceptions, you take off and land into the wind
- To determine wind direction, you need either a windsock or a report from the ground

Entering The Pattern



- Follow method A when there are aircraft operating at the airport
- Follow method B when the airport has no other airplanes in the pattern. (Still discouraged)

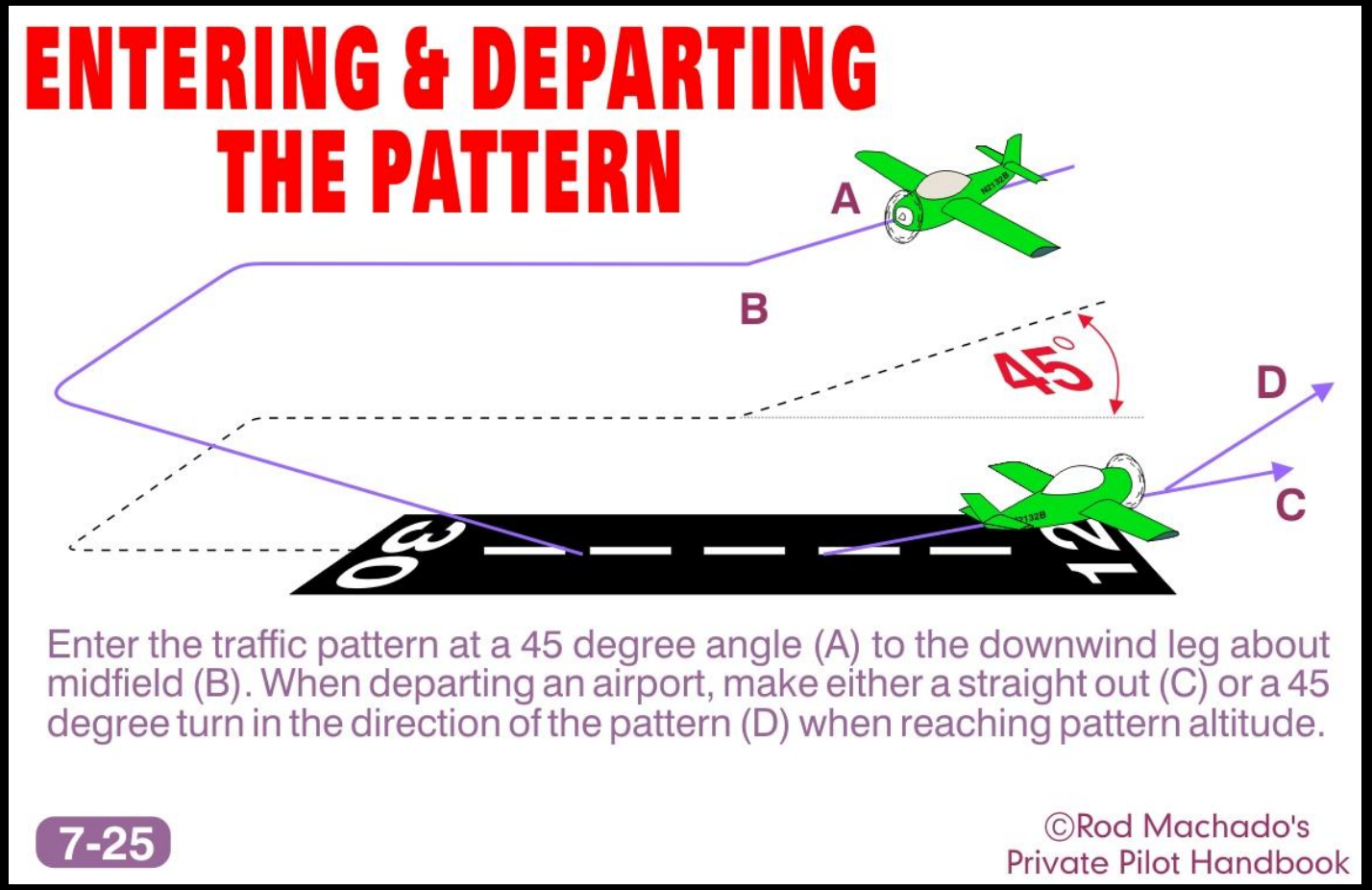
The 45° Entry Point



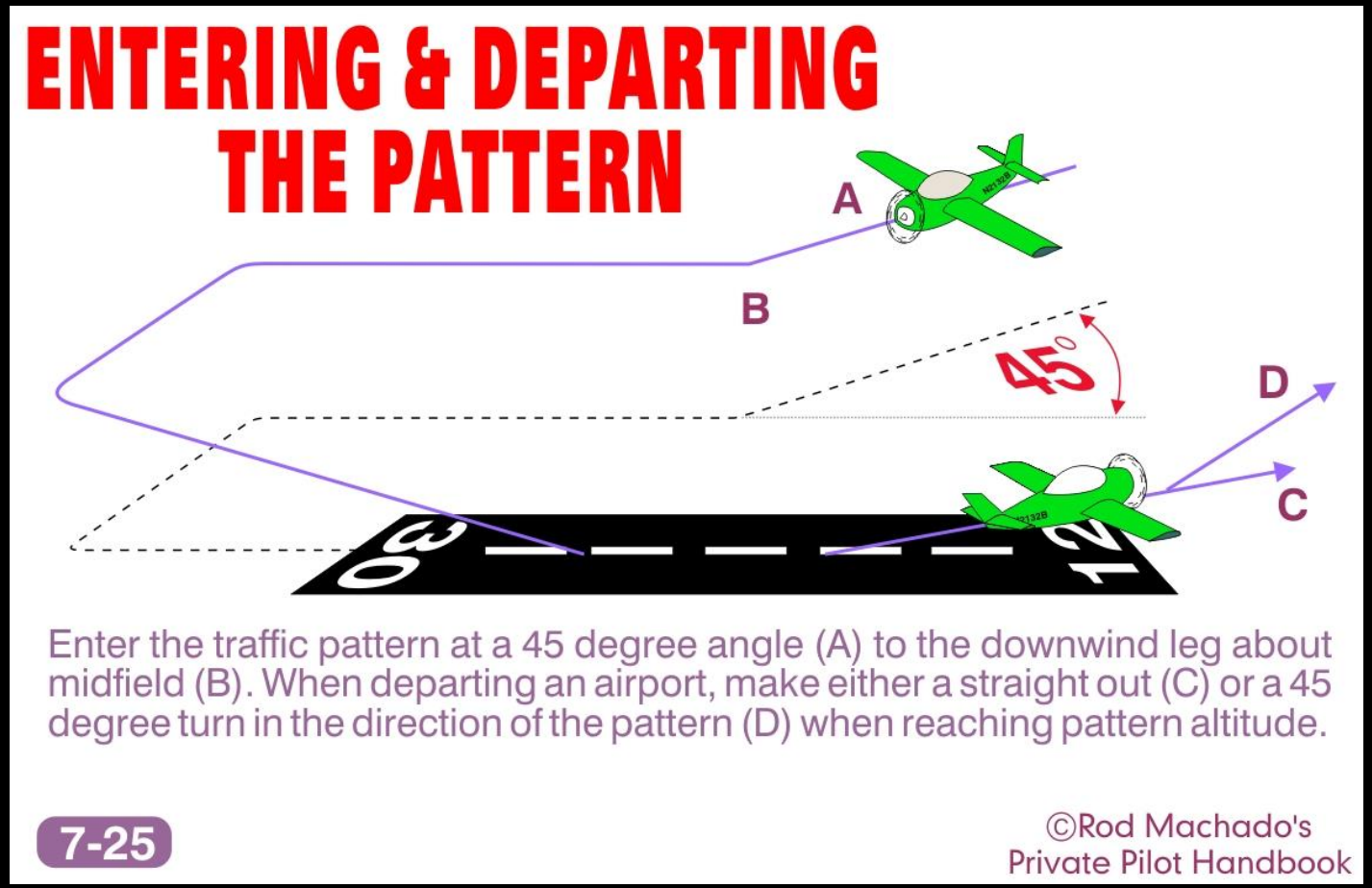
- This angle of entry allows you to see traffic on the crosswind and downwind legs of the pattern
- Also makes it easier for other airplanes in the pattern to see and blend in with you
- At a towered airport controllers will advise you of traffic in the pattern
- They expect you to make a standard pattern entry, at the standard pattern place

The 45° Entry Point

- Always enter the pattern at the specified pattern altitude for that airport
- If no traffic pattern altitude is established, fly the pattern at 1000 feet AGL
- Majority of midair collisions occur within five miles of an airport at an altitude of less than 3,000 feet AGL



Departing The Pattern



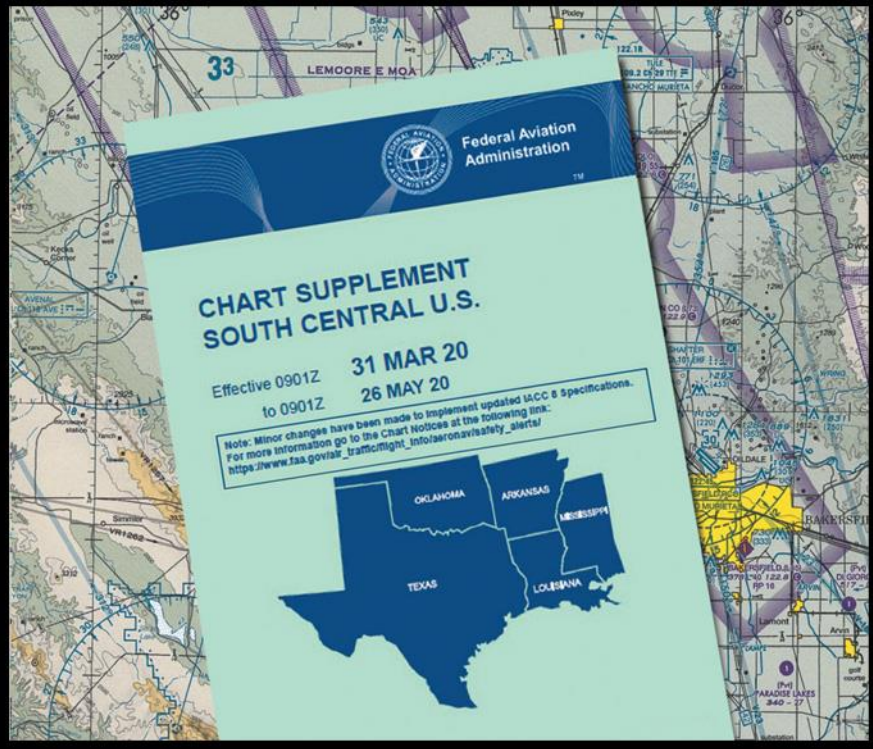
- Departing the pattern requires you to avoid interfering with traffic entering and remaining in the pattern
- Departure can be made straight out, or …
- A 45° turn on the pattern side of the runway is also recommended after reaching traffic pattern altitude

Recommended Departure Procedure

- If there are parallel runways, noise sensitive areas, or obstructions, you should follow the recommended procedures for departing that airport
- Sometimes found posted near the departure end of the runway

Recommended Departure Procedure

- May also be found in the Chart Supplement (CS) or its digital version, the d-CS



17-20

Recommended Departure Procedure

- Chart Supplement

The Chart Supplement describes an airport's departure procedures.

SANTA MONICA MUNI (SMO) 3 E UTC 8(7DT) N34 °00.95 W118 °27.08 LOSANGELES

AIRPORT REMARKS: Attended continuously. PPR for dual wheel acft in excess of 60,000 pounds certified maximum ldg weight, ctc arpt manager 310–458–8591. Helicopter flight training ops prohibited, helicopter ops apch boundry at midfield at or above 900 MSL. No touch/go, stop/go, or low apch permitted on Sat, Sun, holidays, weekdays SS–1500Z ‡. Noise test on 122.85. Continuous noise ordinance in effect ctc noise office prior to arrival 310–458–8759/8692 or 310–434–2640. Noise abatement procedures: Pure jet and stage II (with/without hush kits) prohibited. Maximum noise limit 95.0 senal all acft. No engine starts or departures except PPR lifeguard flights 0700–1500Z ‡ Mon–Fri and 0700–1600Z ‡ weekends. PPR ex–military acft ctc arpt manager 310–458–8591. VFR departures Rwy 21 turn left 10 ° at end of rwy then turn right 225 ° to over–fly golf course W of arpt. No crosswind turn until reaching Lincoln Blvd (1 mile W) and out 800 ft MSL. If departure pattern, no turn before reaching shoreline. Rwy 03 departure no turn prior to freeway located 1

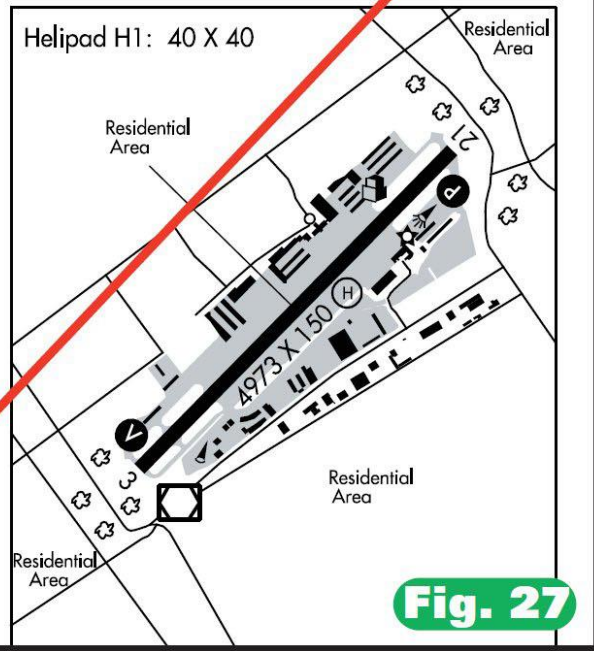
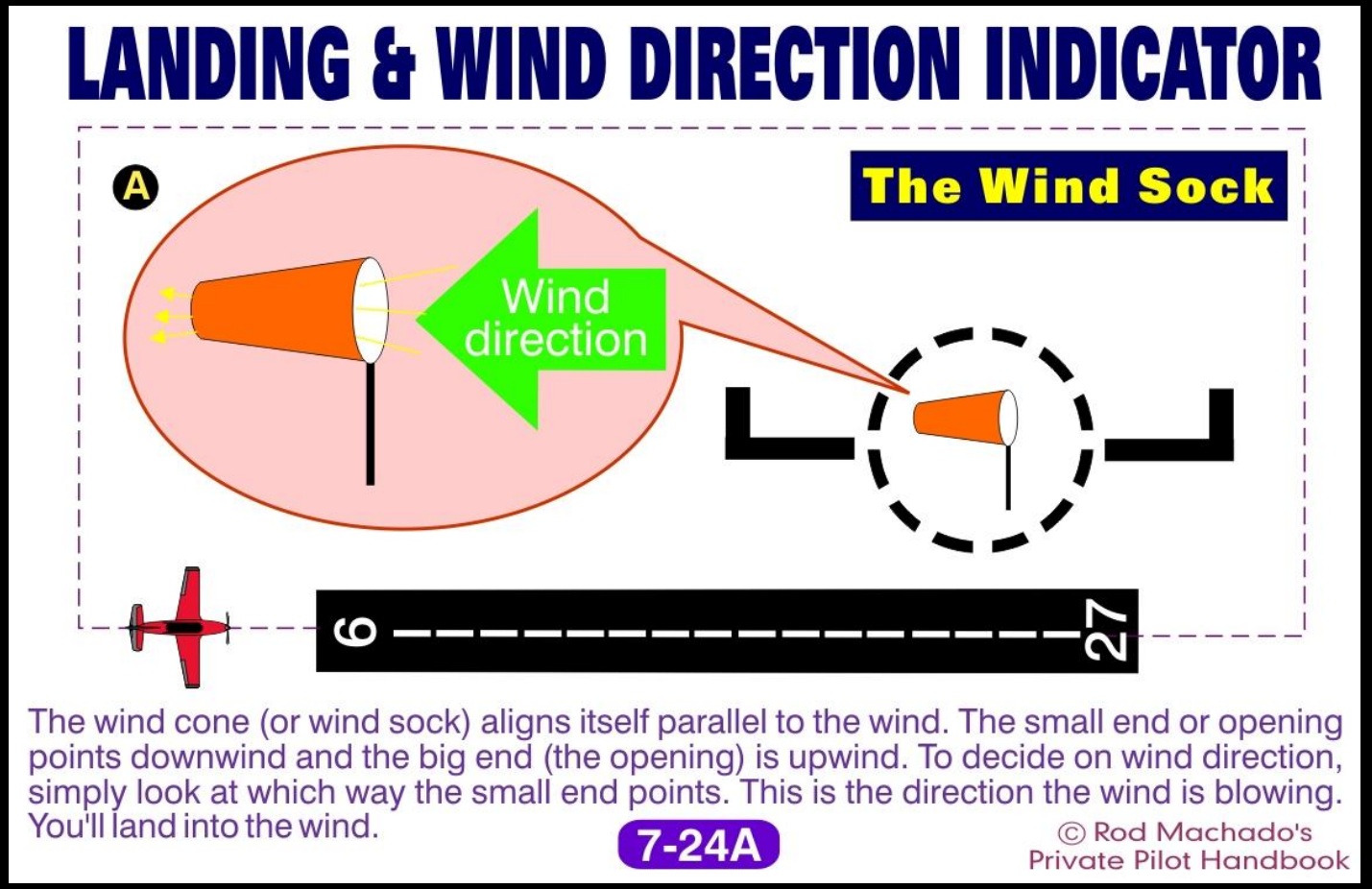


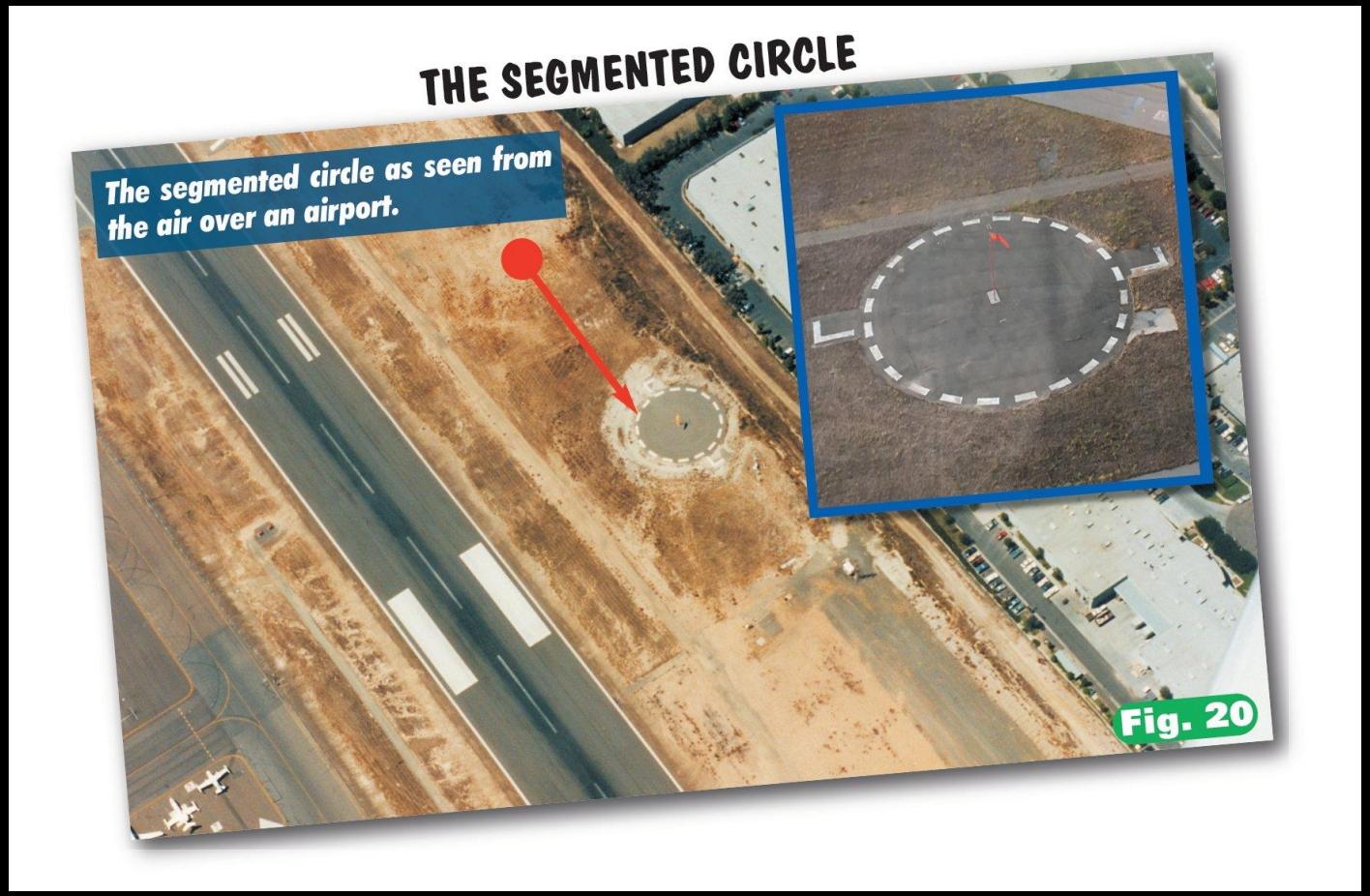
Fig. 27

Windsock

- Difficult to see from the air



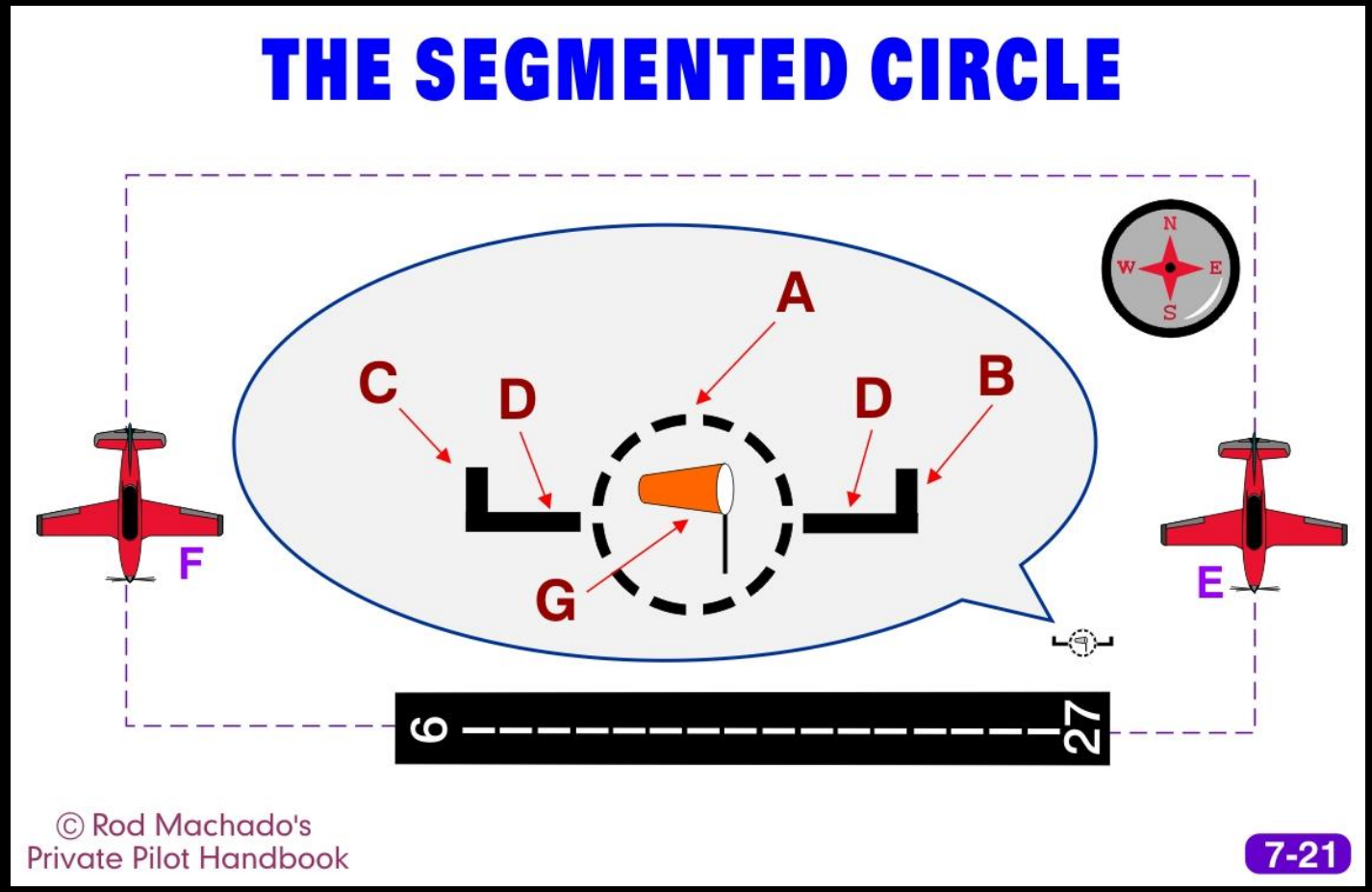
Segmented Circles



- Contain several items to help you decide on the proper runway for landing as well as the appropriate traffic pattern to fly
- Traffic patterns are altered for noise abatement and terrain considerations
- Right traffic patterns are nonstandard

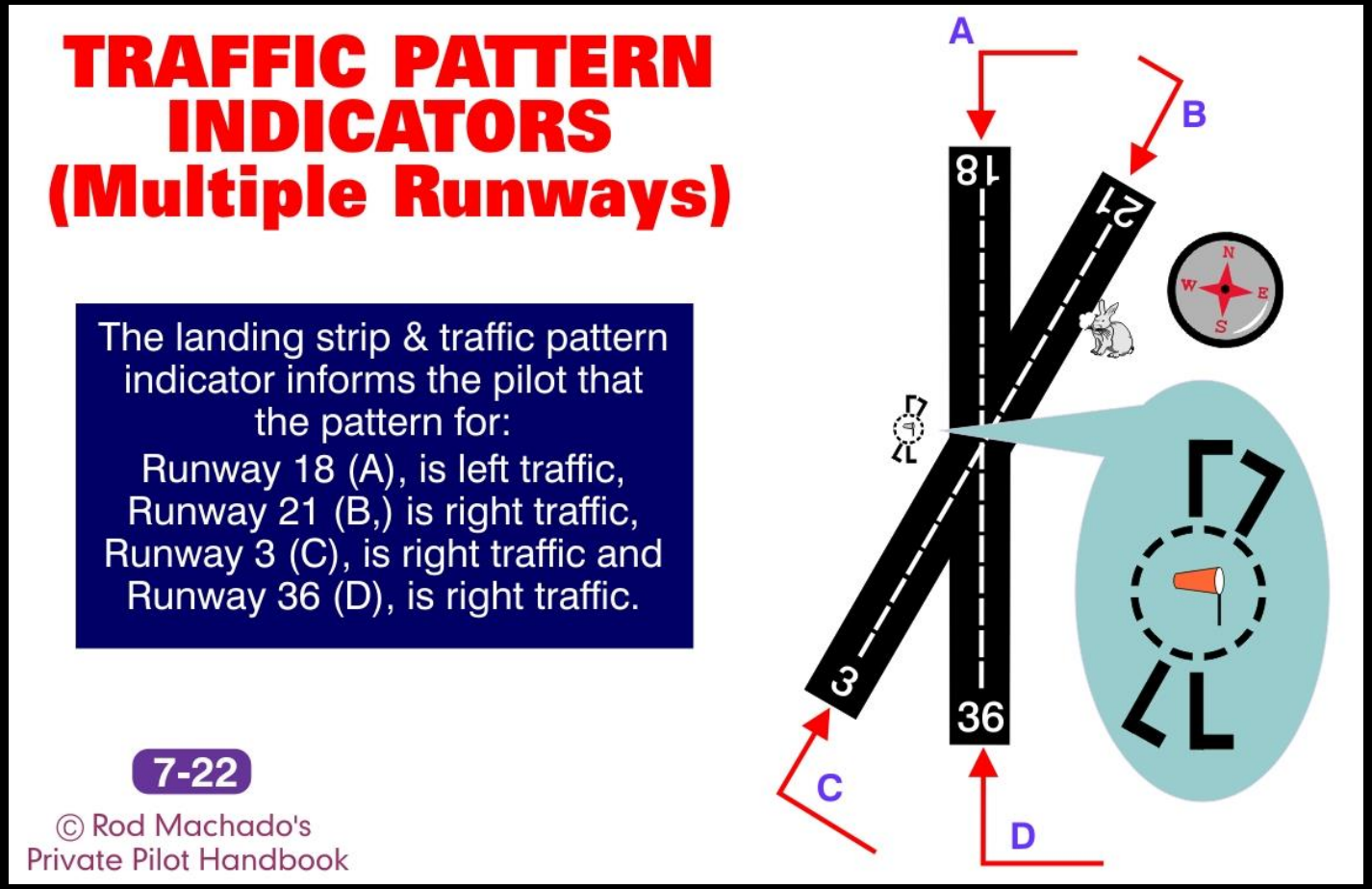
Segmented Circle

- Landing strip indicators (D) are attached to the segmented circle (A)
- Are aligned with and represent the airport's runway(s)
- Traffic pattern indicators (B and C) point to the side of the runway on which the traffic pattern is flown

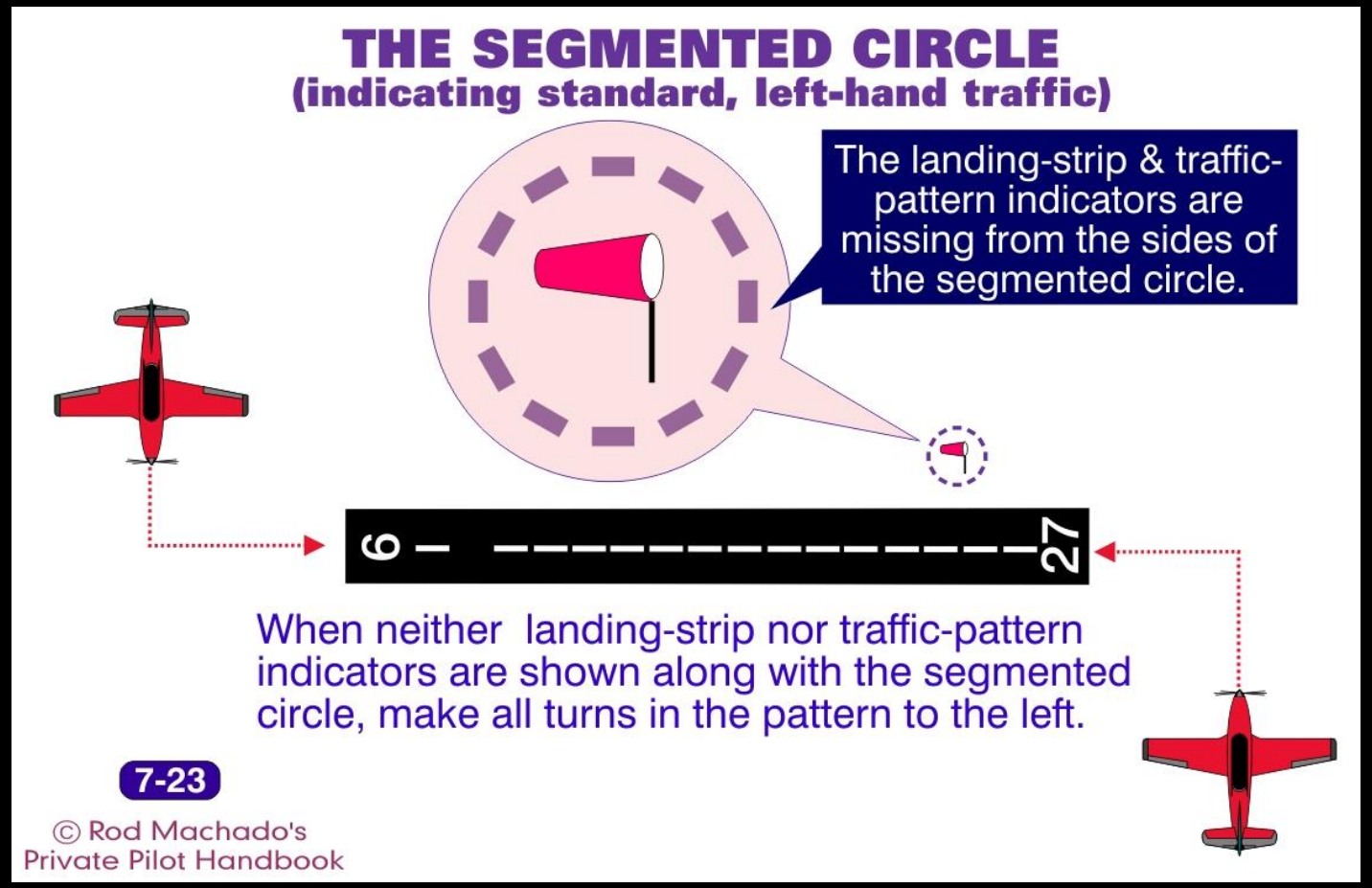


Segmented Circle

- Where two or more runways exist, multiple L shaped bars may protrude from the segmented circle



Lack of Traffic Pattern Indicators



- Left hand traffic is considered standard and pilots should make all turns to the left in the absence of other indications
- Right hand traffic patterns are nonstandard patterns

Wind or Landing Direction Indicators

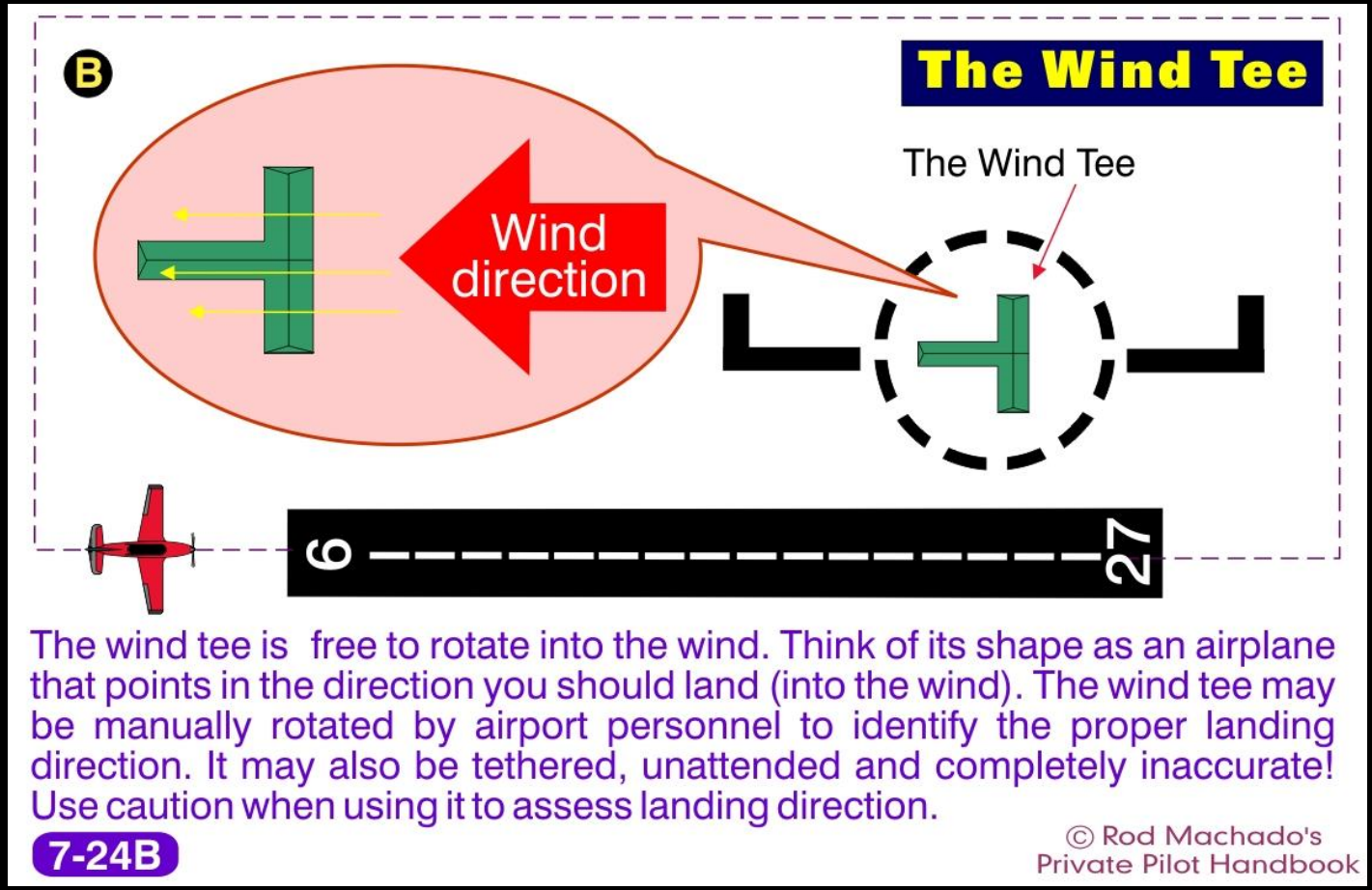
- Some type of wind or landing direction indicators are within the segmented circle
- Help you select a runway for landing that’s most nearly aligned with the wind
- We land into the wind whenever possible
- It slows our touchdown speed and makes landings safer and easier

Wind or Landing Direction Indicators

- Three types of indicators are used to identify the proper direction for landing
- Two are wind direction indicators and the last is a landing direction indicator
- The first type of wind direction indicator is the windsock already discussed

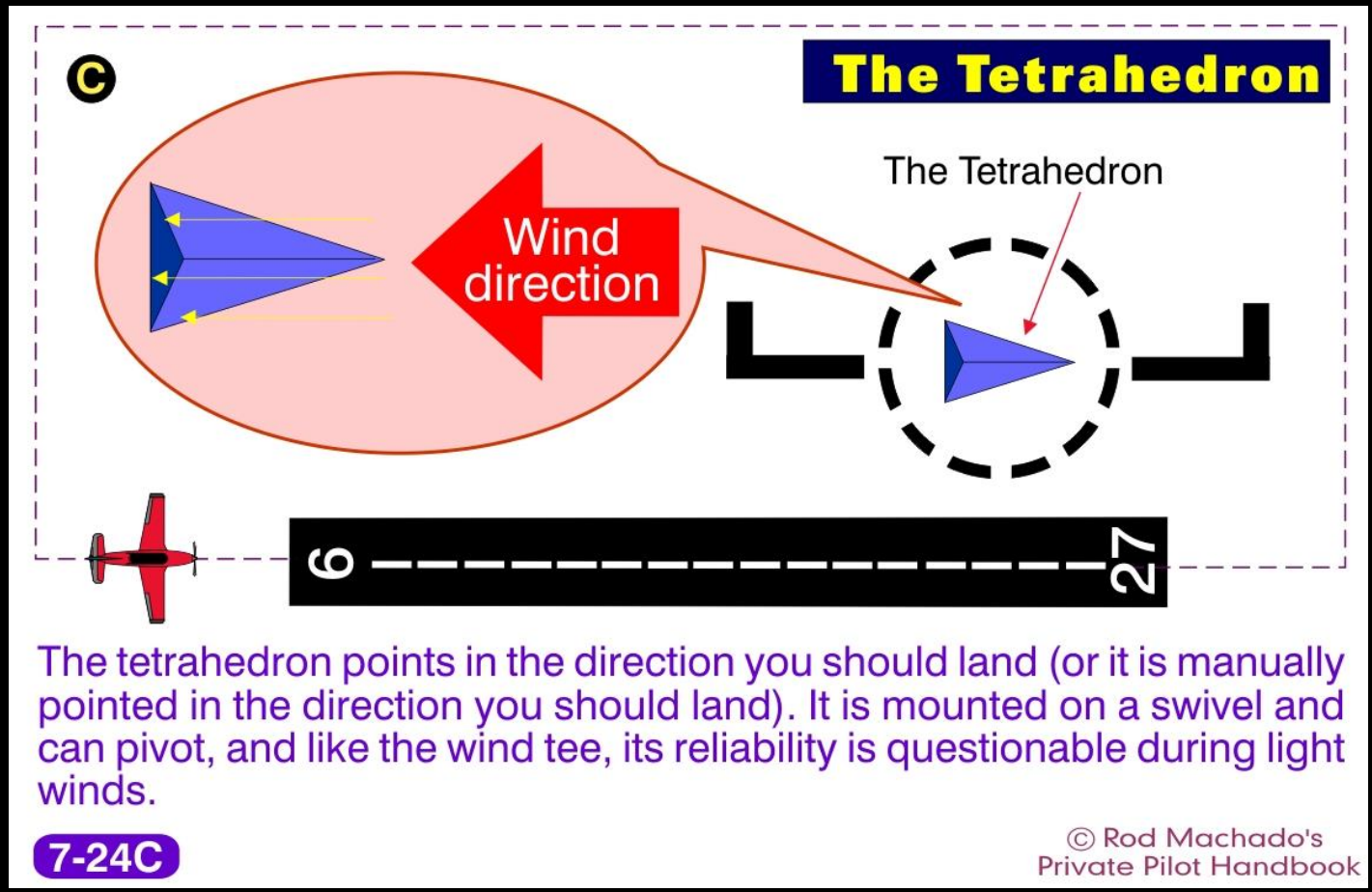
Wind Tee

- One means of determining landing direction
- Land on the runway most nearly aligned in the direction the wind tee points



Tetrahedron

- Four-sided object - 3 sides on top and 1 side on the bottom
- Is a landing-direction indicator instead of a wind indicator
- Land on the runway most nearly aligned with the direction it points



Radio Communications

Airport Operations

CTAF Common Traffic Advisory Frequency

- Airports will be either controlled or uncontrolled
- Operations at controlled airports are accomplished by communicating with an air traffic controller on the tower frequency
- At uncontrolled airports, pilots are not required to use their radio to communicate with other traffic during takeoff or landing See-and-avoid vigilance is considered satisfactory

CTAF Common Traffic Advisory Frequency

- Airplanes with radios tuned to the same (common) frequency can broadcast their intentions to each other while operating in the traffic pattern
- Many uncontrolled airports have CTAF
- Pilots use this to communicate their intentions and receive information during takeoff or landing
- CTAF may be either a unicom, multicom, or tower frequency (if tower is not in operation at the time)

Unicom

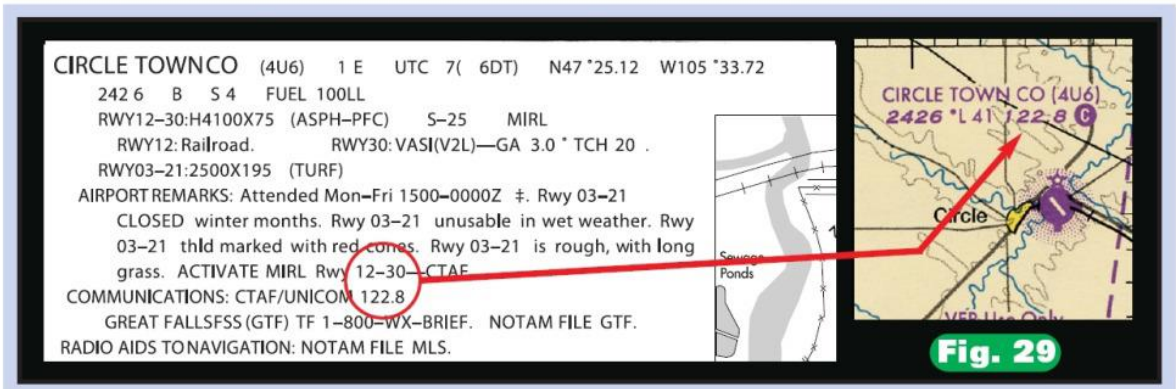
- Many uncontrolled airports have a unicom (universal communications)
- Frequency on which the operator of one of the refueling and repair operations (fixed base operators, or FBO’s) provides information on the wind and traffic pattern directions
- The unicom information is advisory in nature only
- Sometimes they will advise you if there are other aircraft in the pattern or inbound
- The following frequencies are usually reserved for unicom: 122.7,122.8,122.725,122.975,123.0,123.050 and123.075 MHz

Unicom

- While a unicom frequency can also be the CTAF, this is not always the case
- At airports with towers, the tower frequency will usually be the CTAF that’s used when the tower isn’t in service
- Most airports with a tower also have one or more unicom frequencies which are not used as CTAF

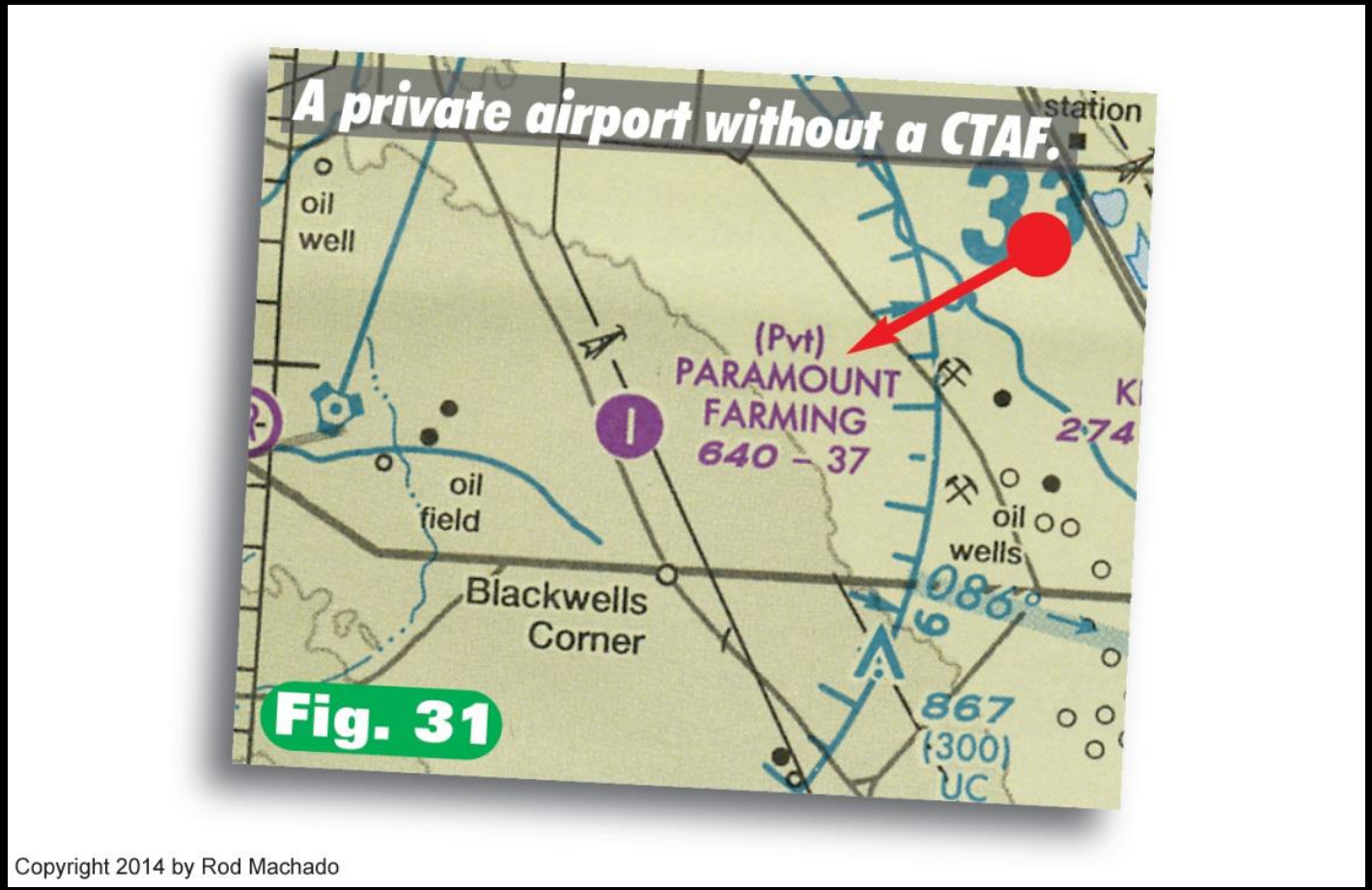
Finding CTAF For Airport

- CTAF is found on the aeronautical sectional chart
- Reverse-bold “C” under the airport shows 122.8 MHz is the CTAF
- Chart Supplement will also show the CTAF



Airport With No CTAF

- (Pvt) Airport is privately owned and you should seek permission from the owner to land there
- If no tower or unicom frequency used as the CTAF, use Multicom frequency 122.9.



Using CTAF

- Broadcast your position 10 miles out when landing at an uncontrolled airport
- CTAF is used to make position reports while in the pattern
- Report your position entering the pattern, when downwind, on base and on final approach
- This lets other airplanes at the airport know your location

Using CTAF

- Since there may be another airport in the vicinity on a similar frequency, state the airport name during these transmissions
- You should also broadcast your intentions on the CTAF when departing an uncontrolled airport
- Make a broadcast before taxiing and on the runway before departure

Using CTAF

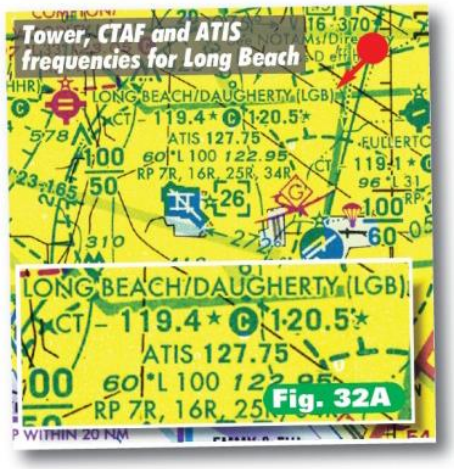
- *“Chester County traffic, Cessna two one three two Bravo entering left downwind for Runway 29, Chester County”*
- *“Hazleton traffic, Cessna two one three two Bravo, at the north FBO, taxiing to Runway 27, Hazleton”*
- *“Laurel traffic, Cessna two one three two Bravo departing Runway 22 to the west, climbing to 5000, Laurel"*

Tower Controlled Airports

- Uncontrolled airports require that you, on your own, identify the wind direction, runway landing direction as well as the appropriate traffic pattern to fly
- At tower-controlled airports the air traffic controller provides you with this information
- This information includes traffic pattern direction, runway to use, directions to fly as well as position reports to make when approaching the airport

Automatic Terminal Information Service (ATIS)

- A recorded broadcast of airport information at many controlled airports
- Provides noncontrol information to help relieve frequency congestion
- Keeps the controller from having to repeat the same airport information (ceiling, wind, visibility, etc.) to pilots landing or departing the airport



CALIFORNIA

LONG BEACH (DAUGHERTY FLD) (LGB) 3 NE UTC−8(−7DT) N33°49.07′ W118°09.10′ LOS ANGELES

clsd—CTAF. Rwy 12–30 HIRL lighted during hours tower clsd. REIL Rwy 12, Rwy 25R, and Rwy 25L, MIRL Rwy 07L–25R, HIRL Rwy 07R–25L, CL TDZL lgts Rwy 12–30 not avbl when ATCT clsd. VASI Rwy 25R and PAPI Rwy 25L opr 1500–0600Z‡ only. VASI Rwy 12 and PAPI Rwy 30 opr continuously. NOTE: See Special Notices — Air Carrier Operations Vicinity of Long Beach (Daugherty Fld), CA.

WEATHER DATA SOURCES: ASOS (562) 424-0572.

COMMUNICATIONS: CTAF 119.4 ATIS 127.75 (562) 595-8564 UNICOM 122.95

Ⓡ SOCAL APP CON 124.65

Ⓡ SOCAL DEP CON 127.2

LONG BEACH TOWER 119.4 (Rwy 30 apch, Rwy 12 dep) 120.5 (Rwy 12 apch, Rwy 30 dep) (1415–0745Z‡)

GND CON 133.0 CLNC DEL 118.15

AIRSPACE: CLASS D svc 1415–0745Z‡ other times CLASS G.

RADIO AIDS TO NAVIGATION: NOTAM FILE HHR.

SEAL BEACH (L) VORTACW 115.7 SLI Chan104 N33°47.00′ W118°03.29′ 278° 5.3 NM to fld. 23/15E. HIWAS.

BECCA NDB (LOM) 233 LG N33°45.40′ W118°04.64′ 301° 5.2 NM to fld.

ILS 110.3 I-LGB Rwy 30. Class IT. LOM BECCA NDB. Unmonitored when twr clsd. MM unmonitored.

Fig. 32B

ATIS

- Updated when any significant change occurs at the airport or upon the receipt of any official hourly or special weather information
- Each new recording gets the name of the next phonetic alphabet letter in order
- When approaching an airport with an ATIS, listen to the ATIS broadcast when approximately 25 miles from the airport
- If departing the airport, listen to the ATIS broadcast prior to contacting the tower for taxi instructions

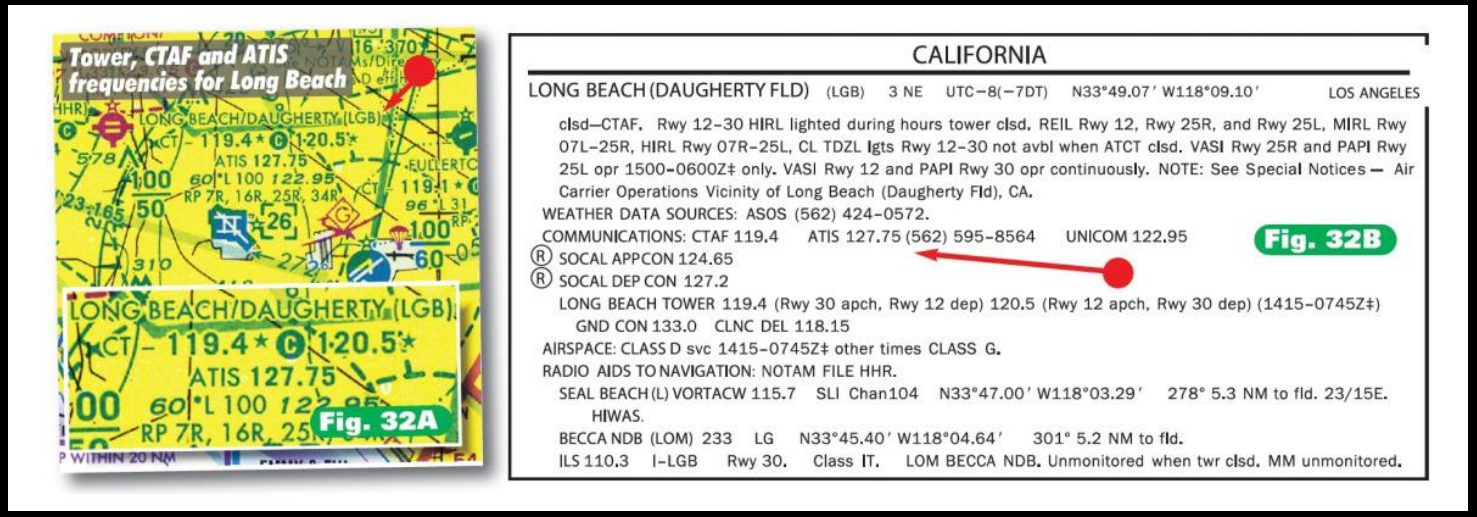
ATIS Broadcast

- *“This is Pittsburgh airport information Hotel, 1300 Zulu weather. Thirteen hundred scattered, measured ceiling three thousand broken, visibility 4 smoke and haze, wind 260 at 10. Altimeter 30.04. ILS Runway 28L in use. Landing and departing on Runways 28L and 28R. Contact Ground Control on 121.9. For Runway 28L contact tower on 128.3. For Runway 28R contact tower on 118.5. Inform the controller on initial contact you have information Hotel”*

- Note: ceilings and visibilities are not broadcast when they are above 5,000 feet and more than five miles

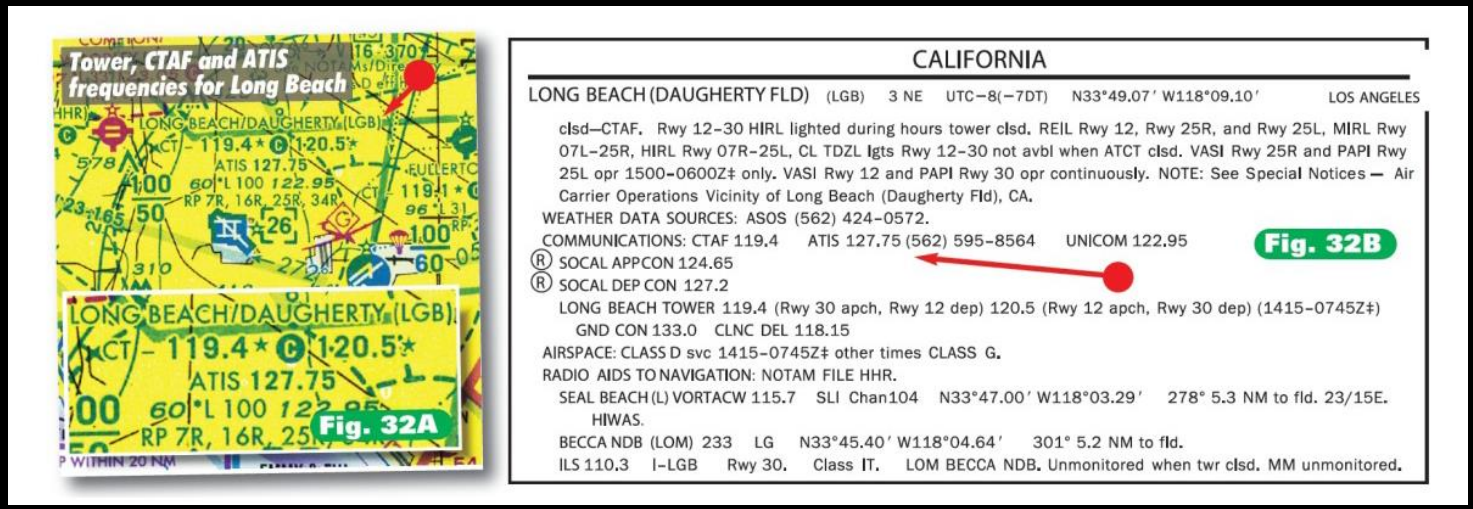
Automatic Terminal Information Service (ATIS)

- The control tower (CT) frequencies are 119.4 and 120.5 MHz;
- 119.4 MHz is the CTAF (reverse bold “C”) used whenever the tower isn’t in operation
- ATIS frequency is 127.75 MHz.



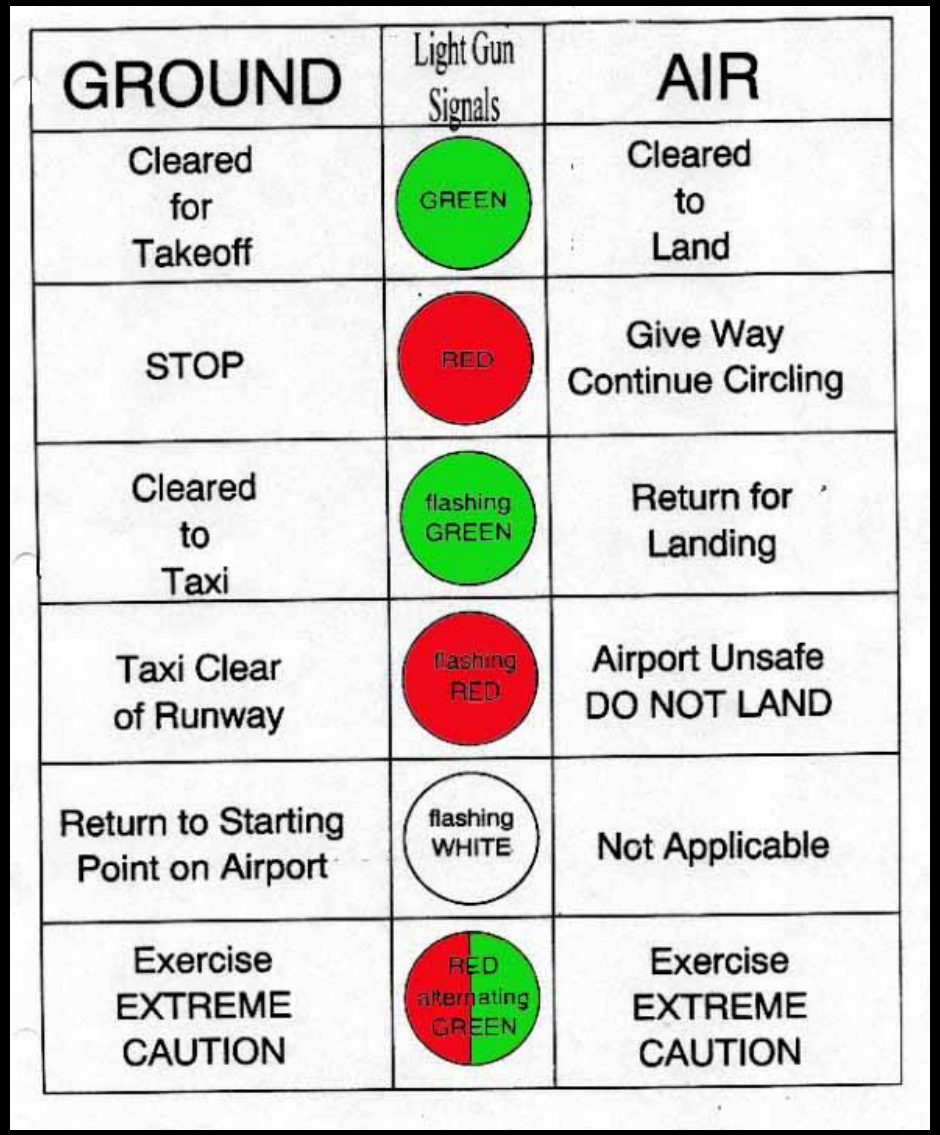
Automatic Terminal Information Service (ATIS)

- Chart Supplement



ATC Light Gun Signals

- Light gun signals are a tool used by Air Traffic Control Towers (ATCT) when:
  - No radio is equipped on the aircraft
  - Communications cannot be established, or
  - During communication malfunctions
- Applies not only to aircraft, but to ground vehicles, equipment, and personnel not equipped with radios.
- ATC personnel use a directive traffic control signal which emits an intense narrow light beam of a selected color (either red, white, or green) when controlling traffic by light signals



GROUND	Light Gun Signals	AIR
Cleared for Takeoff	GREEN	Cleared to Land
STOP	RED	Give Way Continue Circling
Cleared to Taxi	flashing GREEN	Return for Landing
Taxi Clear of Runway	flashing RED	Airport Unsafe DO NOT LAND
Return to Starting Point on Airport	flashing WHITE	Not Applicable
Exercise EXTREME CAUTION	RED alternating GREEN	Exercise EXTREME CAUTION

ATC Services

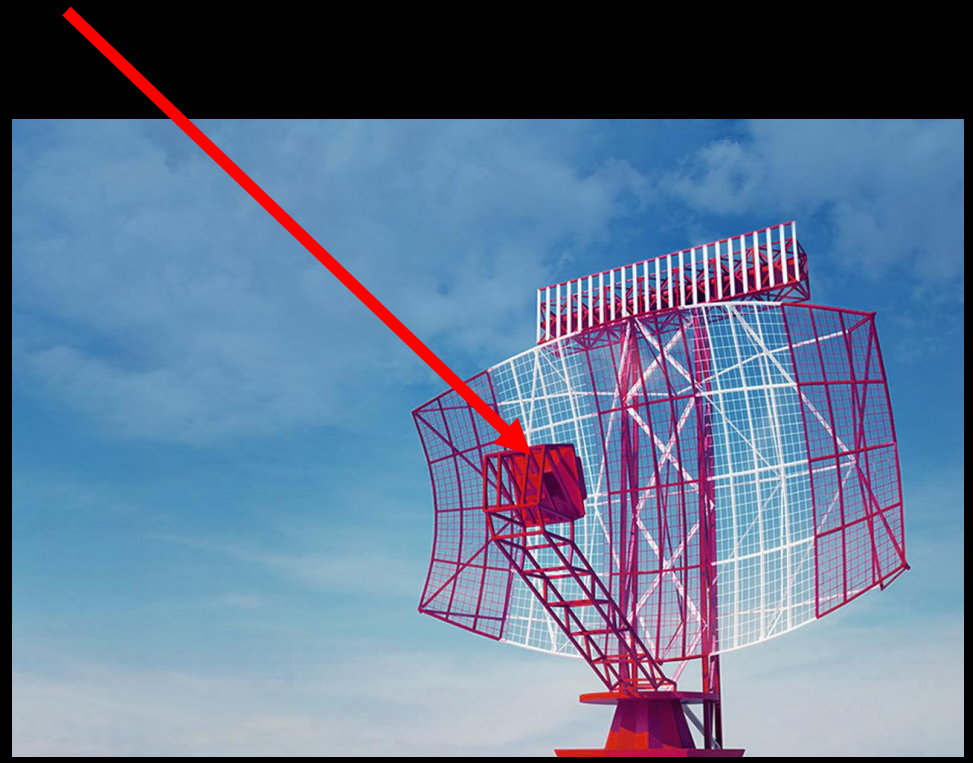
Airport Operations

Primary Radar

- Radar is a device that provides information on range, azimuth, and/or elevation of objects in the path of the transmitted pulses.
- It measures the time interval between transmission and reception of radio pulses and correlates the angular orientation of the radiated antenna beam or beams in azimuth and/or elevation.
- Range is determined by measuring the time it takes for the radio wave to go out to the object and then return to the receiving antenna. The direction of a detected object from a radar site is determined by the position of the rotating antenna when the reflected portion of the radio wave is received.

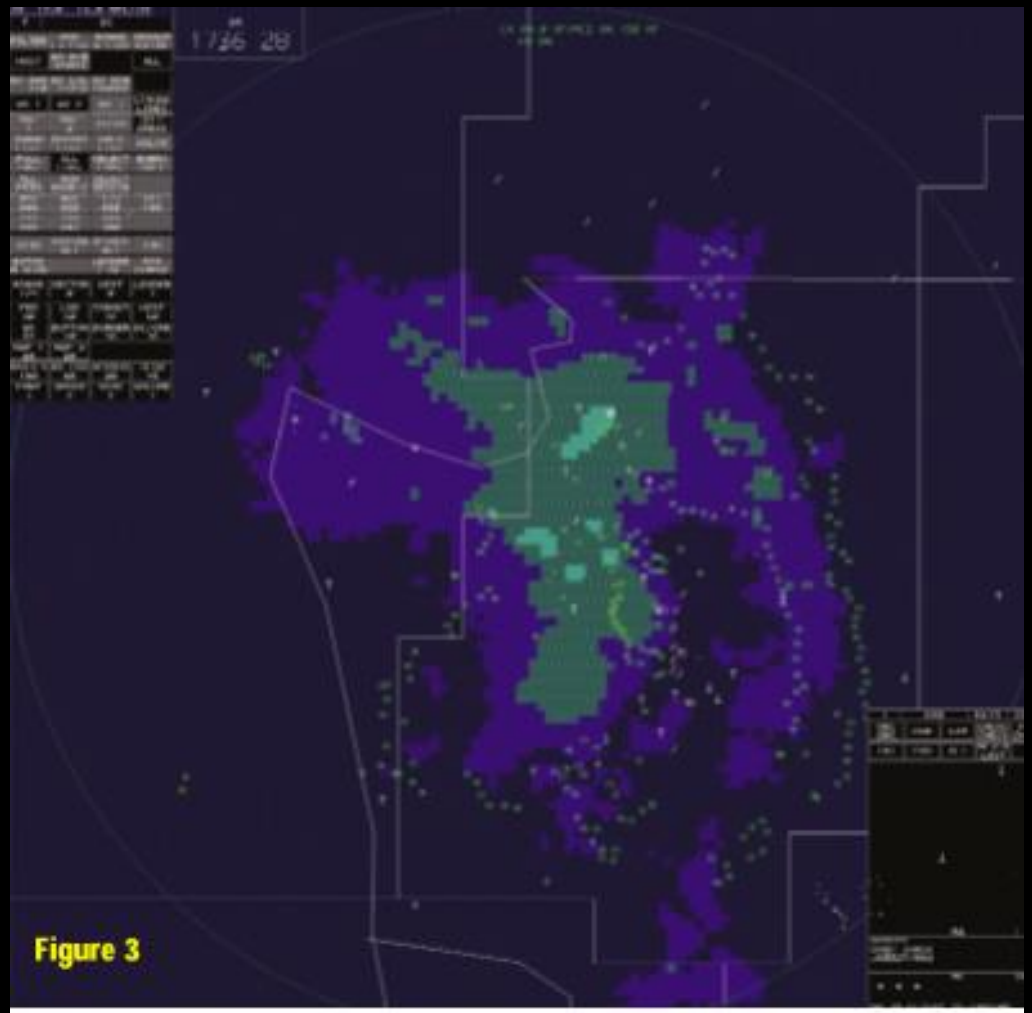
Secondary Radar

- The ATC radar beacon system (ATCRBS) is often referred to as “secondary surveillance radar.”
- Interrogates aircraft transponders to receive more detailed information about that aircraft.



Secondary Radar

- The ATC radar system can also detect and display weather data.
- Data isn’t the most detailed but provides great help in avoiding sever weather

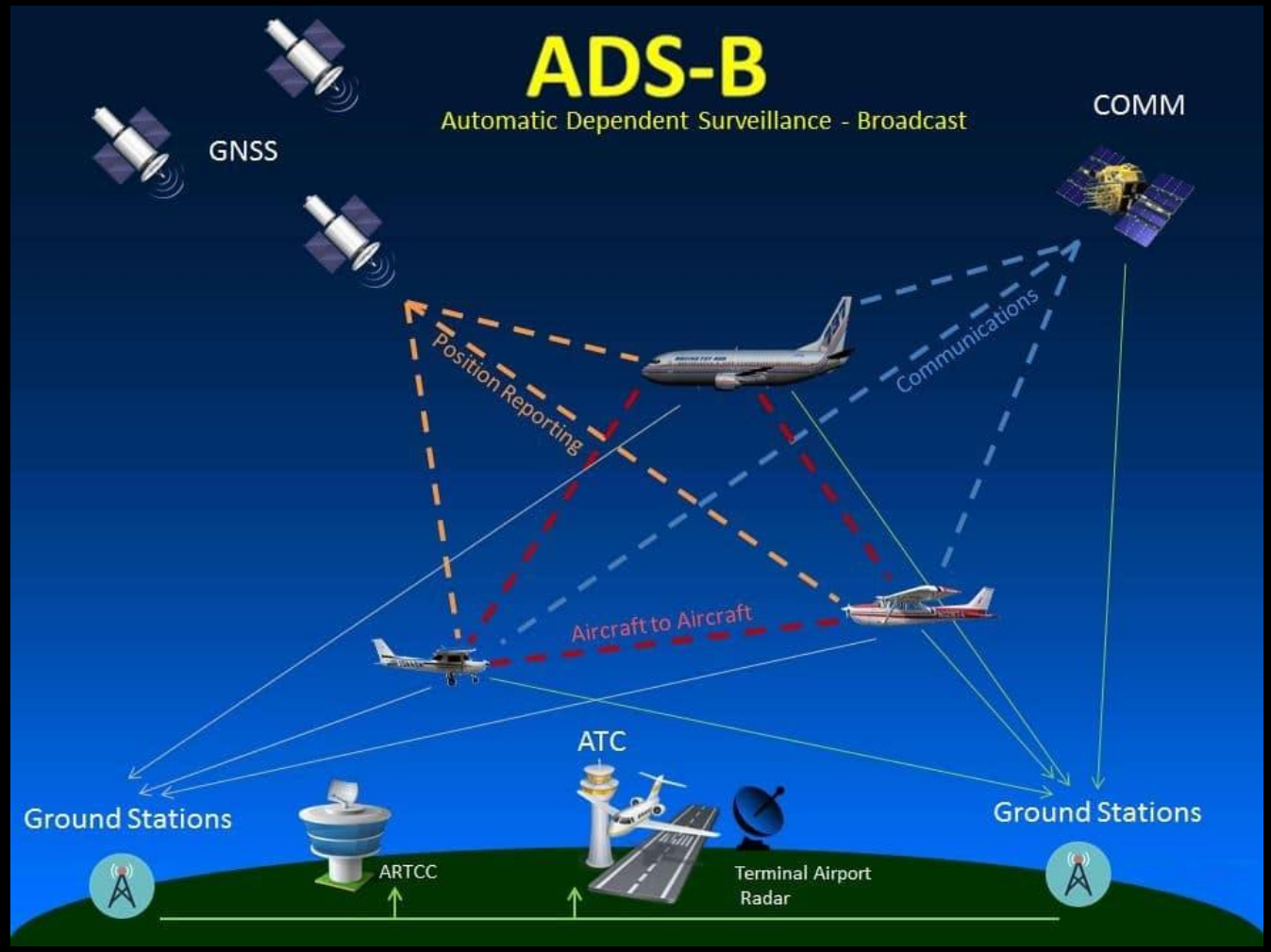


ARTCC Displaying both WARP/NEXRAD (color) and ARSSR (/////'s and HHHH's) depicting moderate through extreme precipitation

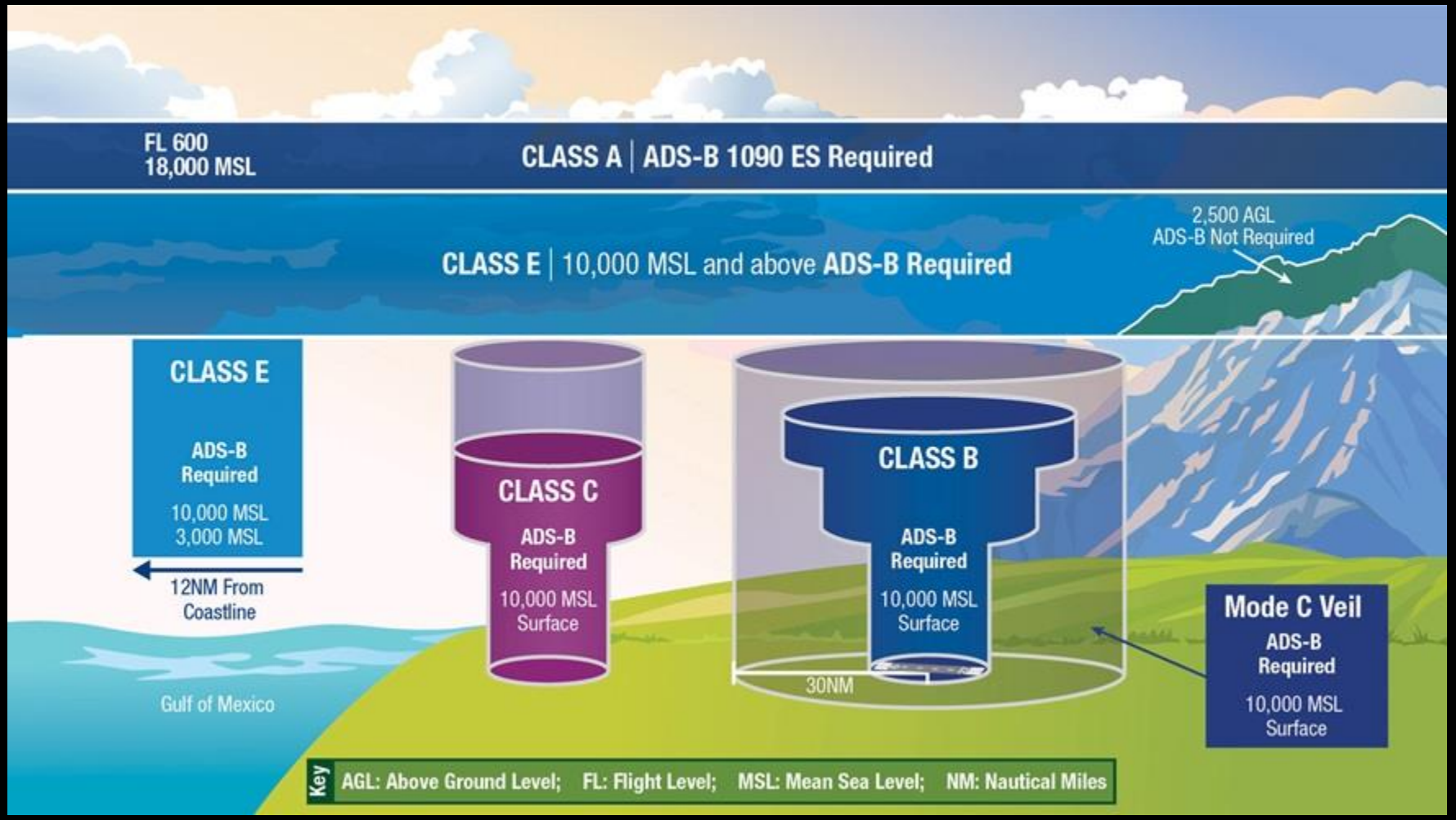
Secondary Radar

Automatic Dependent Surveillance–Broadcast (ADS-B)

- A surveillance technology being deployed throughout the NAS to facilitate improvements needed to increase the capacity and efficiency of the NAS, while maintaining safety.
- Most aircraft today are equipped with ADS-B in or in and out



Automatic Dependent Surveillance–Broadcast (ADS-B)

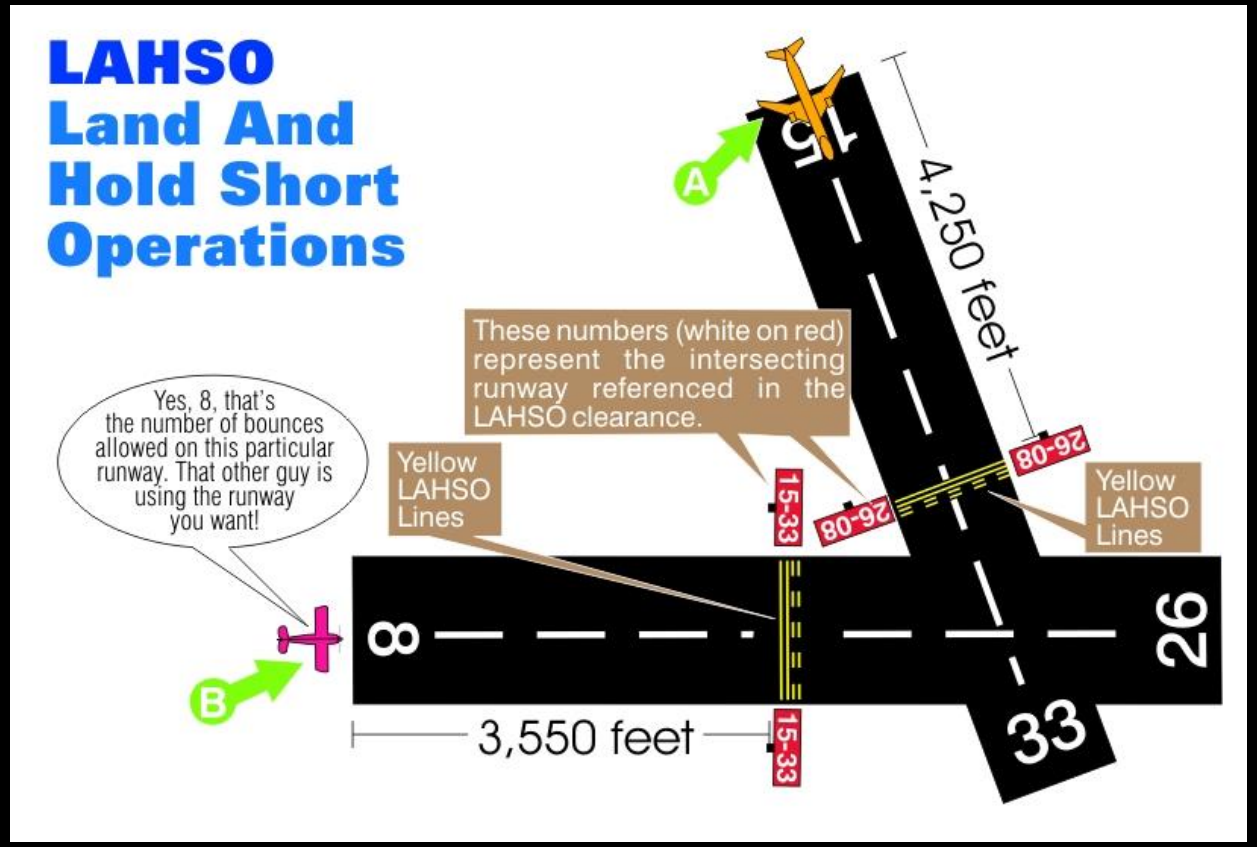


Collision Avoidance

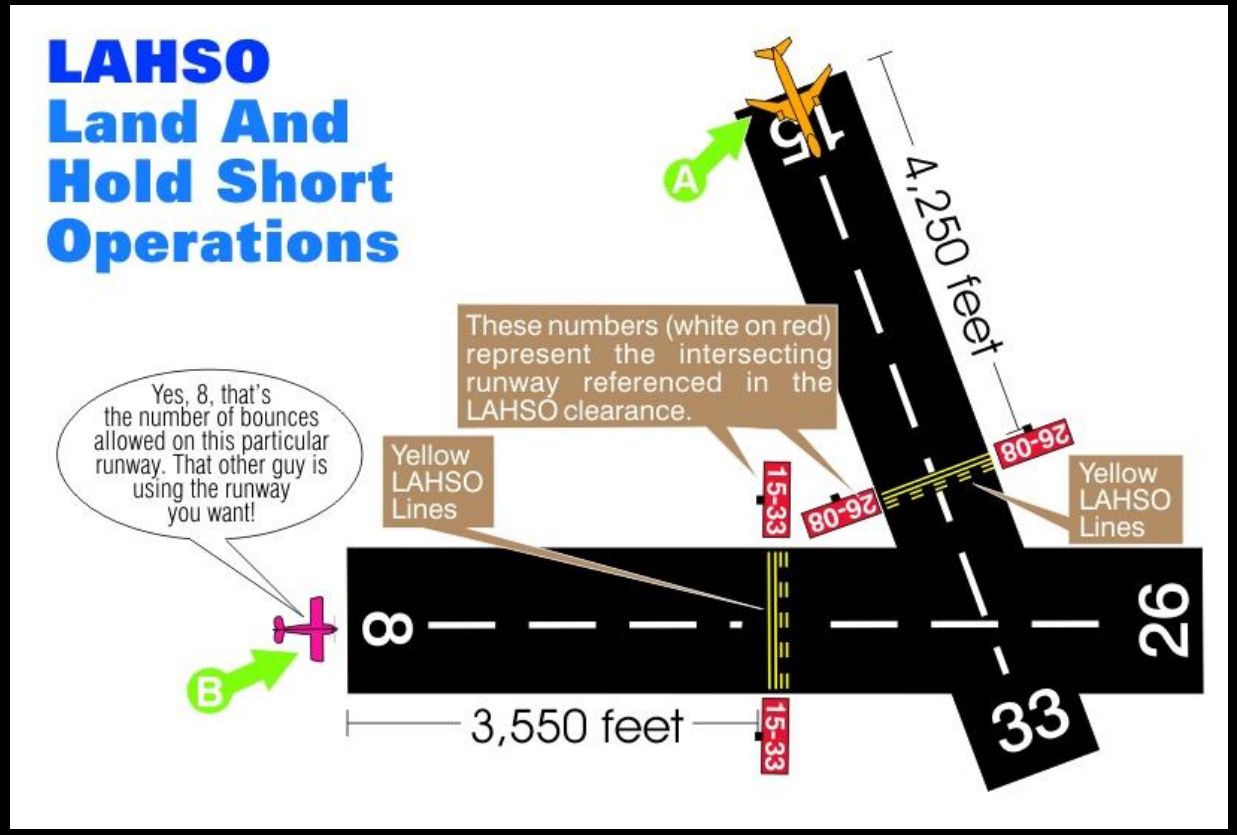
Airport Operations

LAHSO

- Provides visual signage to land and hold short of intersecting runways, taxiways or other designated points on a runway
- Two solid yellow lines followed by two rows of dashed yellow lines along with runway number identifiers on each side depict the designated LAHSO hold point



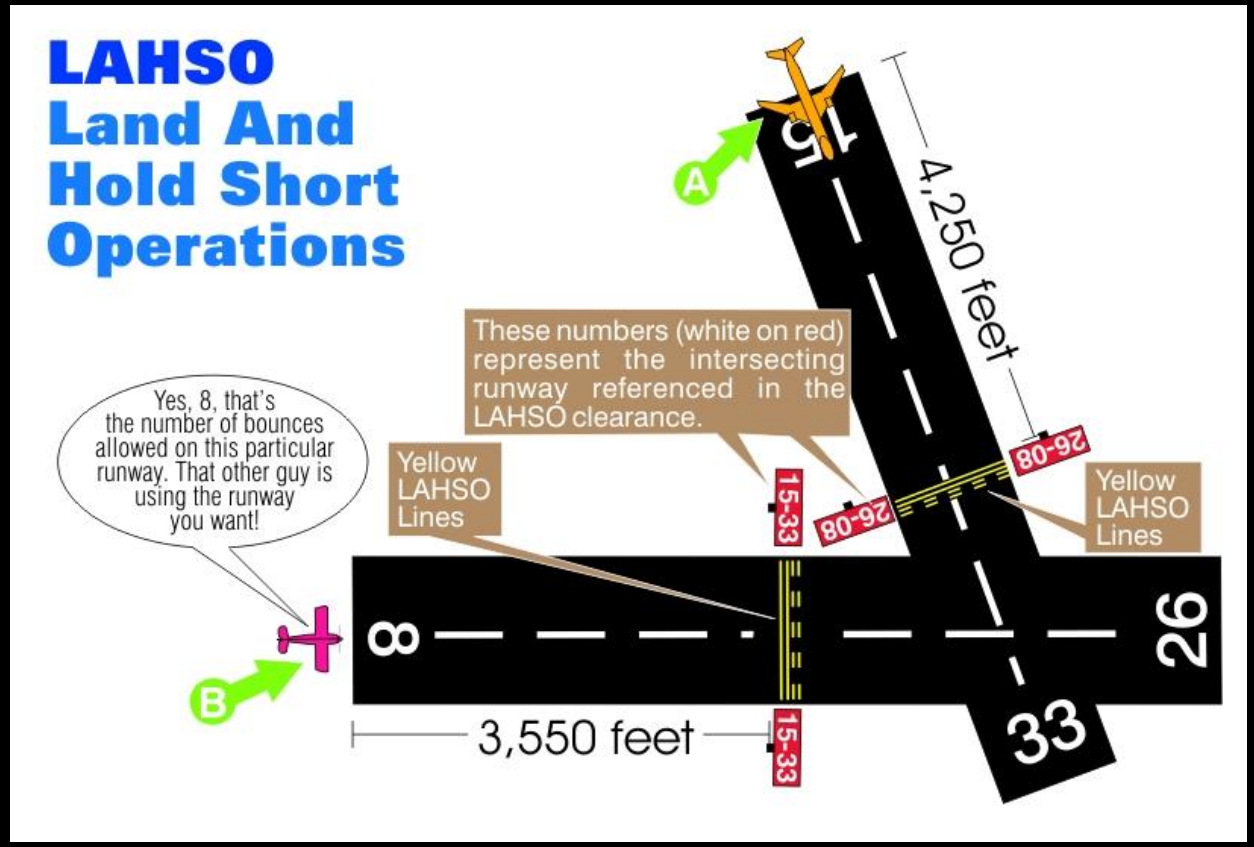
LAHSO



- You're in Airplane B and are landing on Runway 8
- ATC clears you to land but instructs you to hold short of Runway 15 for crossing traffic (Airplane A)
- If you accept the LAHSO clearance, you can't use the full length of Runway 8

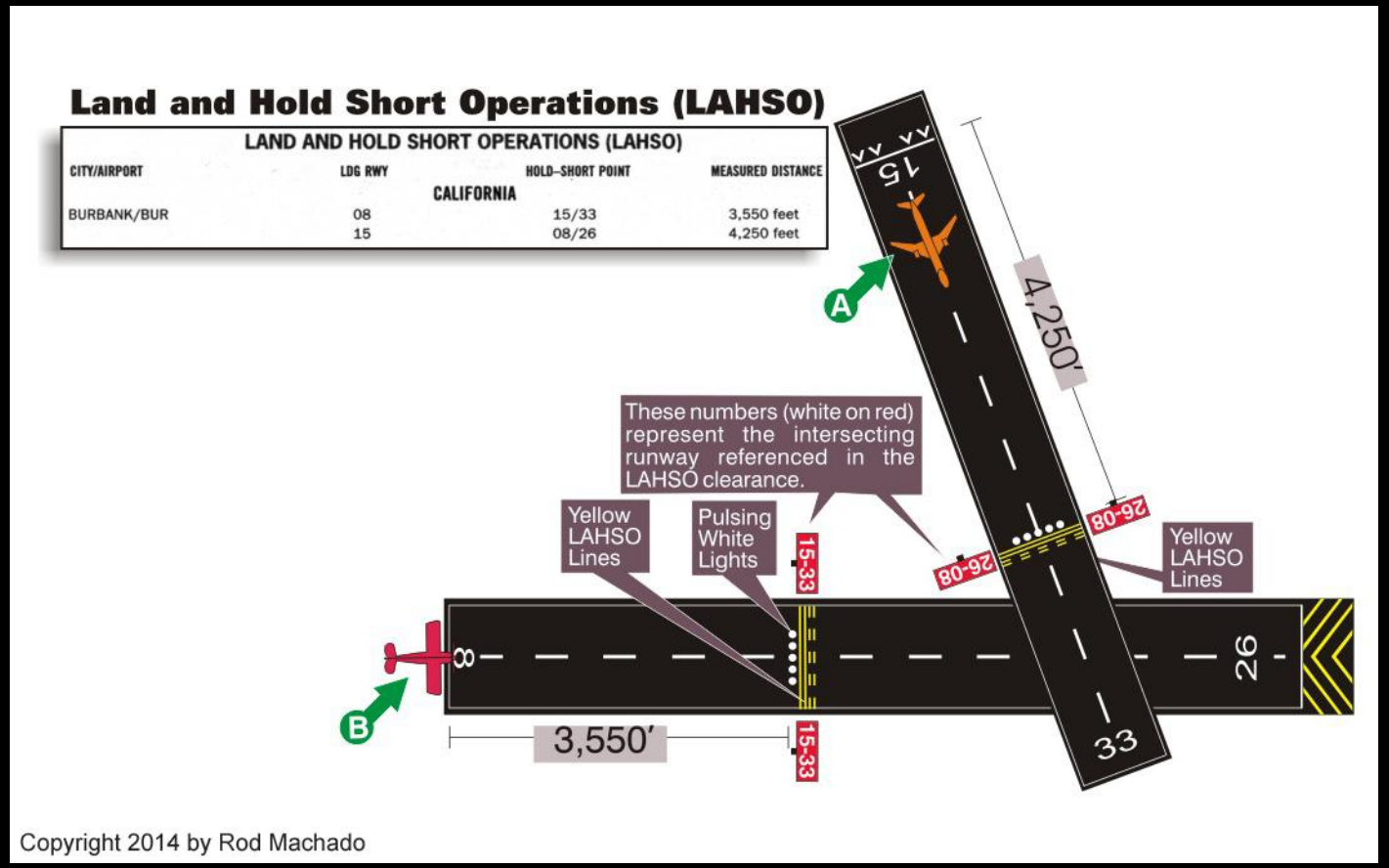
LAHSO

- A LAHSO clearance doesn't preclude a rejected landing (a go-around)
- If this is necessary, then go around, but maintain safe separation from other traffic and promptly notify the controller



Available Landing Distance

- Check the available landing distance (ALD) in the Special Notices section of the Chart Supplement to ensure you can land and stop safely
- You should land and exit by the first convenient taxiway short of the LAHSO hold lines
- If you can't exit the runway, then hold at the LAHSO hold lines



LAHSO Notes

- A ceiling of 1000’ and 3 miles visibility is required for a LAHSO clearance
- Student pilots and pilots who are not familiar with LAHSO should not participate in this program
- You must give the controller a full readback of the LAHSO clearance
- If you need the full length of the runway, do not accept the clearance

“Line-Up and Wait”

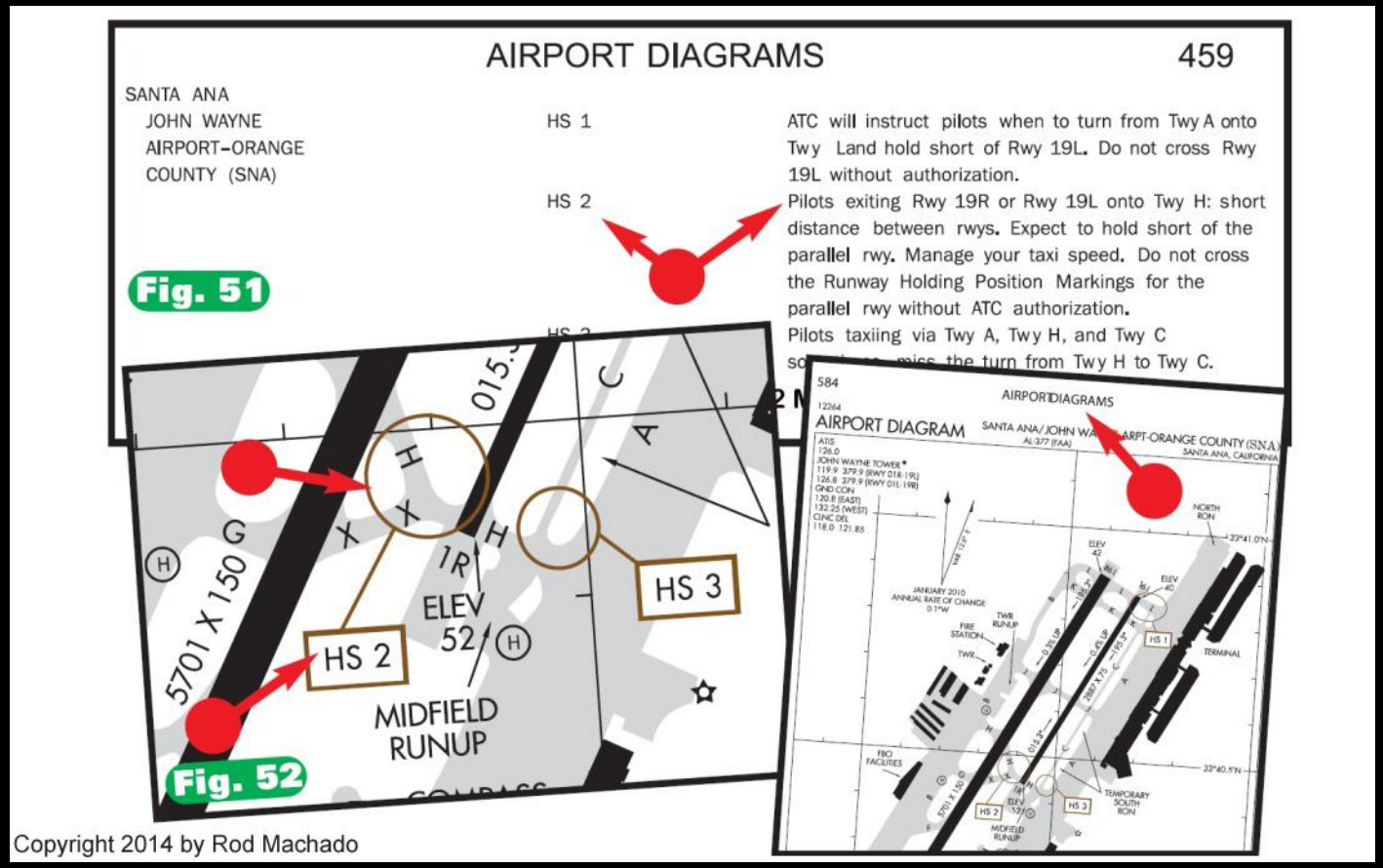
- ATC may issue a “Line-Up and Wait” clearance in lieu of a takeoff clearance.
- This instruction meant to taxi onto the runway and them come to a complete stop once in position.
- This clearance does not allow for takeoff. Just taxi into position and wait.

Avoiding Runway Incursions

- Runway incursions are events involving the unauthorized presence of an aircraft, vehicle or person on a protected area designated for the landing and takeoff of aircraft
- Tower controlled airports have their airport surface divided into movement areas such as taxiways and runways, and nonmovement areas such as ramps, aprons, etc.
- You must obtain a taxi clearance before entering a movement area

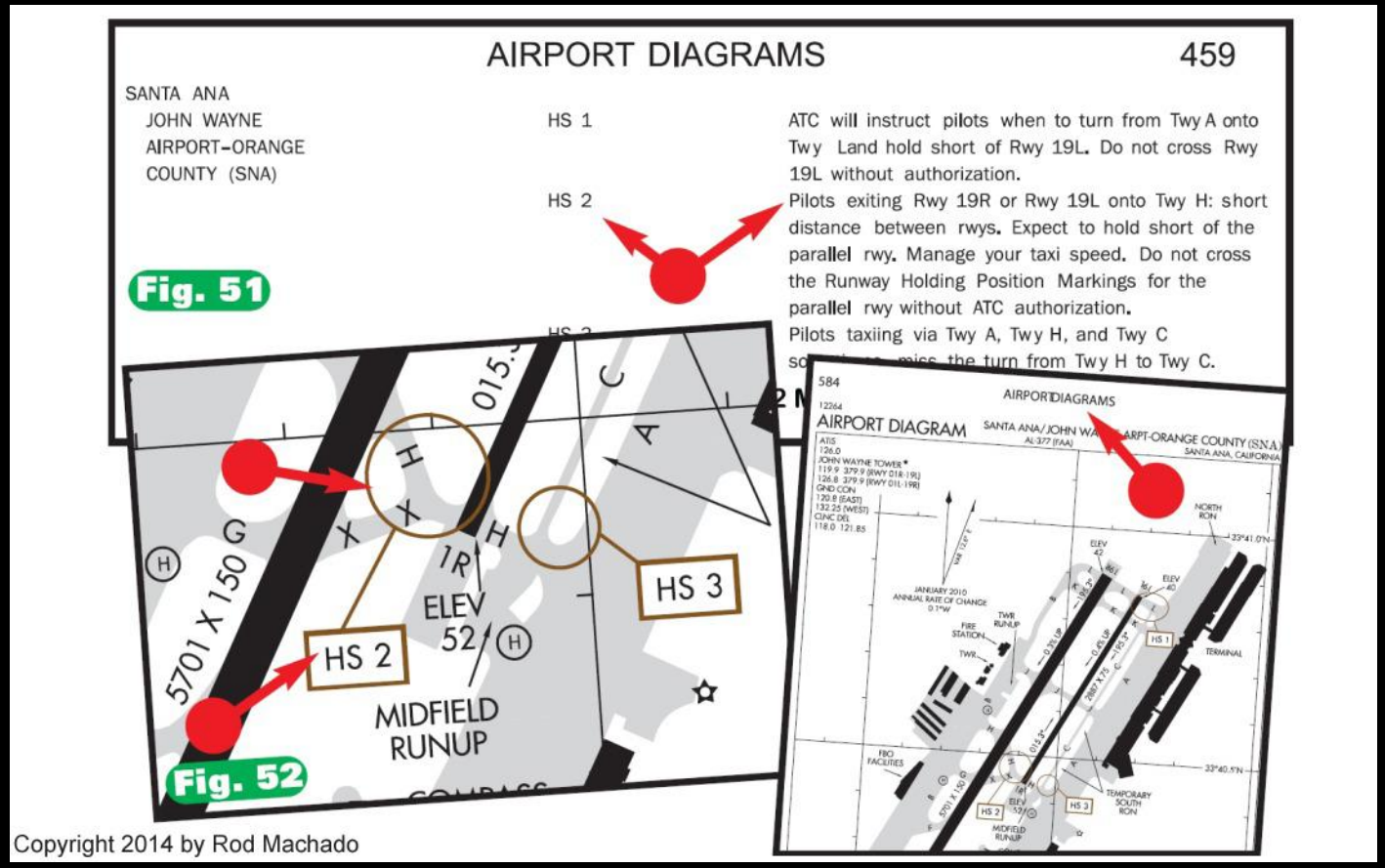
Hot Spots

- Check the Digital Chart Supplement "supplemental" pages for the airport diagram and the hot spots page
- The hot spots page describes any recognized hot spots for an airport
- These are areas designated by the letters HS followed by a reference number on the airport diagram



Hot Spots

- Hot spots are enclosed by open circles or polygons
- Are areas which are complex or confusing areas of taxiway or runway intersections offering increased risk of runway incursions
- Look closely at these areas before taxi and before landing
- Use the airport diagram to plot your taxi route to the departure runway



Avoiding Runway Incursions

- If at any time you become uncertain about your position or the instructions you were given, ask ATC to repeat them or request progressive taxi instructions (meaning that ATC will give you step-by-step taxi instructions)
- ATC will normally give you a clearance to the departure runway
- If ATC tells you to hold short of the runway, you are required to read back all runway hold short instructions to the controller
- When ATC wants you to taxi onto the runway, you'll hear the words "line up and wait"

Avoiding Runway Incursions

- If you're waiting on the runway and don't hear anything from ATC for 90 seconds, call them and remind them of where you are
- ATC requires pilots to state their position on the airport when calling the tower for takeoff from a runway intersection
- Never taxi onto a runway unless you've been given clearance to do so
- Pilots are requested to illuminate all external airplane lights when crossing any runway
- When lining up on the runway at night, do so a little to the left or right of the centerline so that your aircraft can be differentiated from the runway lights

Avoiding Runway Incursions

- Keep your eyes open and looking outside
- Ask ATC for clarification when necessary
- Before you start taxiing, always use your airport diagram to make certain you know where you're going and how you are going to get there

EMAS

- EMAS is Engineered Material Arresting System designed to safely decelerate and stop and aircraft overrunning a runway.
- Special mesh with concrete that sinks under great weights.

Knowledge Check

A new ATIS comes out every?

A. Hour
B. 4 hours
C. 6 hours
D. 24 hours

Knowledge Check

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A. Hour
~~B. 4 hours~~
~~C. 6 hours~~
~~D. 24 hours~~

Knowledge Check

At a non-towered airport, a pilot should always try to enter the pattern on what leg?

A. Crosswind
B. 45 to the downwind
C. Base
D. Long straight-in final

Knowledge Check

At a non-towered airport, a pilot should always try to enter the pattern on what leg?

A. ~~Crosswind~~
B. 45 to the downwind
C. ~~Base~~
D. ~~Long straight-in final~~

Knowledge Check

Where can a pilot determine if a runway has right pattern?

A. CTAF/UNICOM
B. Chart Supplement
C. FAA Airport Database
D. ATC

Knowledge Check

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~~A. CTAF/UNICOM~~

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