

Area of Operation **VII** - Task **F**

Normal and Crosswind Approach and Landing

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Key References:

- Airplane Flying Handbook
- Pilot Wind Shear Guide (AC 00-54)
- Procedures during Taxi Operations

1. Introduction

- **What:** Approach procedure where power is available, final approach has no obstacles and landing surface is firm. Normal approach is expected into the wind. If perpendicular wind, then Crosswind technique is needed.
- **Why:** Landing is a maneuver present in every flight and must be done properly to ensure safety.
- **What we are looking for:**
 - Landing performance to consider
 - Proper procedures during traffic pattern
 - Stabilized Approach
 - Smooth and Controlled roundout
 - Centerline landing with no side loading
 - Crosswind techniques
 - Impact of Wind Shear and Wake Turbulence
 - Usage of Checklist



- ➡ **Standard (ACS):**
- PPL: Approach airspeed **+10/-5 kts**, Touchdown **+400/-0 ft**
 - CPL: Approach airspeed **±5 kts**, Touchdown **+200/-0 ft**

2. Landing Performance & Limitations

Limitations

- POH Chapter 2

○ *Flaps*

Performance

- POH Chapter 5

○ *Ground Roll*

○ *Runway required*

SECTION 5 PERFORMANCE

CESSNA
MODEL 172S NAV III
GFC 700 AFCS

SHORT FIELD LANDING DISTANCE AT 2550 POUNDS

CONDITIONS:

Flaps FULL
Power IDLE
Maximum Braking

Zero Wind
Paved, Level, Dry Runway
Speed at 50 ft: 61 KIAS

Pressure Altitude Feet	0°C		10°C		20°C		30°C		40°C	
	Gnd Roll Feet	Total Feet To Clear 50 Foot Obst	Gnd Roll Feet	Total Feet To Clear 50 Foot Obst	Gnd Roll Feet	Total Feet To Clear 50 Foot Obst	Gnd Roll Feet	Total Feet To Clear 50 Foot Obst	Gnd Roll Feet	Total Feet To Clear 50 Foot Obst
Sea Level	545	1290	565	1320	585	1350	605	1380	625	1415
1000	565	1320	585	1350	605	1385	625	1420	650	1450
2000	585	1355	610	1385	630	1420	650	1455	670	1490
3000	610	1385	630	1425	655	1460	675	1495	695	1530
4000	630	1425	655	1460	675	1495	700	1535	725	1570
5000	655	1460	680	1500	705	1535	725	1575	750	1615
6000	680	1500	705	1540	730	1580	755	1620	780	1660
7000	705	1545	730	1585	760	1625	785	1665	810	1705
8000	735	1585	760	1630	790	1670	815	1715	840	1755

NOTE

- Short field technique as specified in Section 4.
- Decrease distances 10% for each 9 knots head wind. For operation with tail winds up to 10 knots, increase distances by 10% for each 2 knots.
- For operation on dry grass runway, increase distances by 45% of the "ground roll" figure.
- If landing with flaps up, increase the approach speed by 9 KIAS and allow for 35% longer distances.

SECTION 2 OPERATING LIMITATIONS

CESSNA
MODEL 172S NAV III
GFC 700 AFCS

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in Figure 2-1. Maneuvering speeds shown apply to normal category operations. The utility category maneuvering speed is 98 KIAS at 2200 pounds.

AIRSPEED LIMITATIONS

SYMBOL	SPEED	KCAS	KIAS	REMARKS
V _{NE}	Never Exceed Speed	160	163	Do not exceed this speed in any operation.
V _{NO}	Maximum Structural Cruising Speed	126	129	Do not exceed this speed except in smooth air, and then only with caution.
V _A	Maneuvering Speed:			Do not make full or abrupt control movements above this speed.
	2550 Pounds	102	105	
	2200 Pounds	95	98	
V _{FE}	Maximum Flap Extended Speed:			Do not exceed this speed with flaps down.
	FLAPS 10°	107	110	
	FLAPS 10° to FULL	85	85	
-----	Maximum Window Open Speed	160	163	Do not exceed this speed with windows open.

Figure 2-1

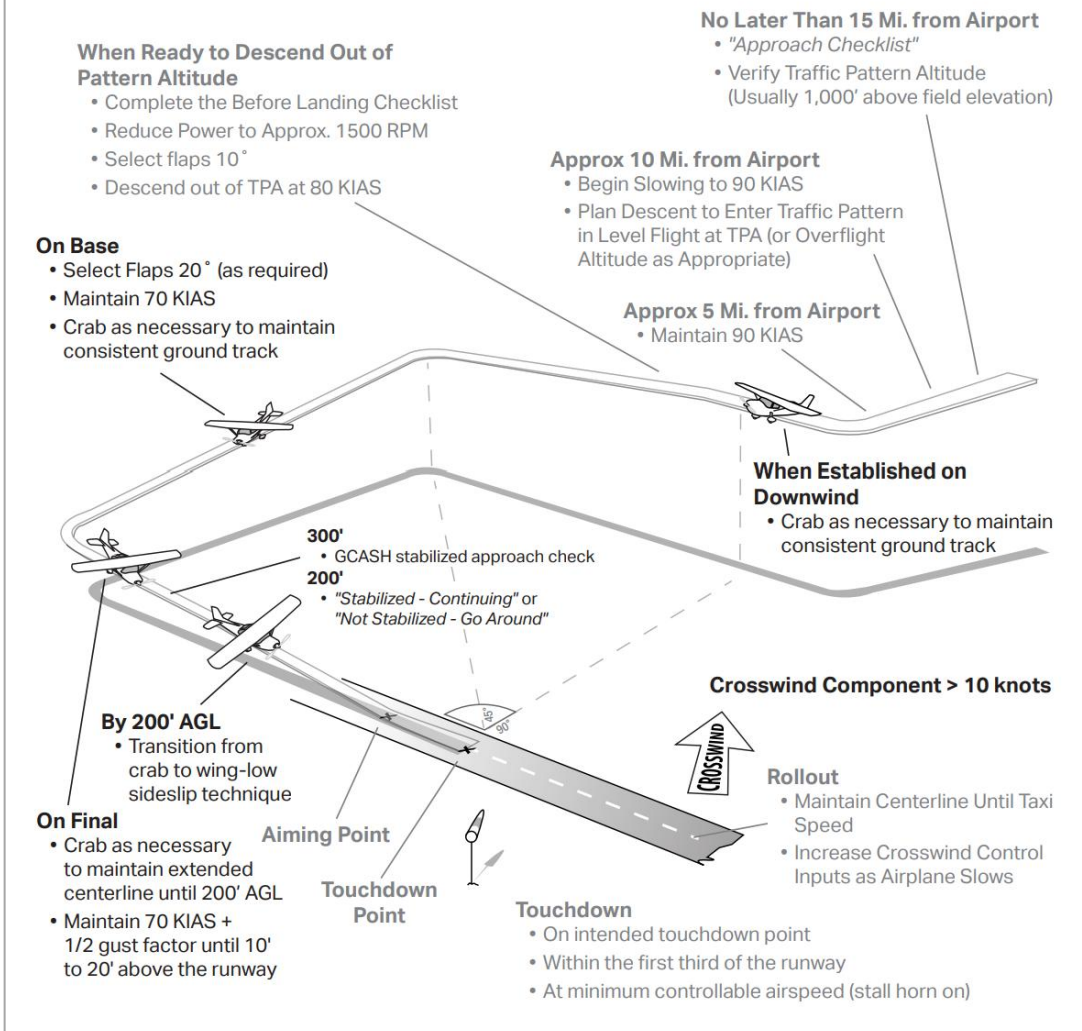
NOTE

Maximum demonstrated crosswind velocity is 15 knots (not a limitation).

3. Traffic Pattern

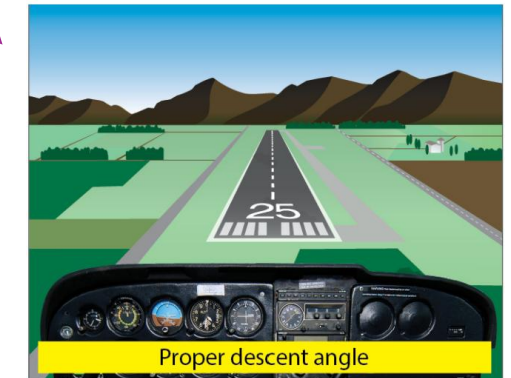
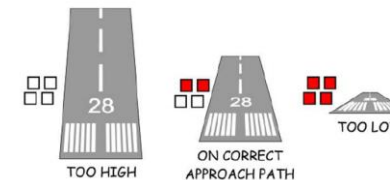
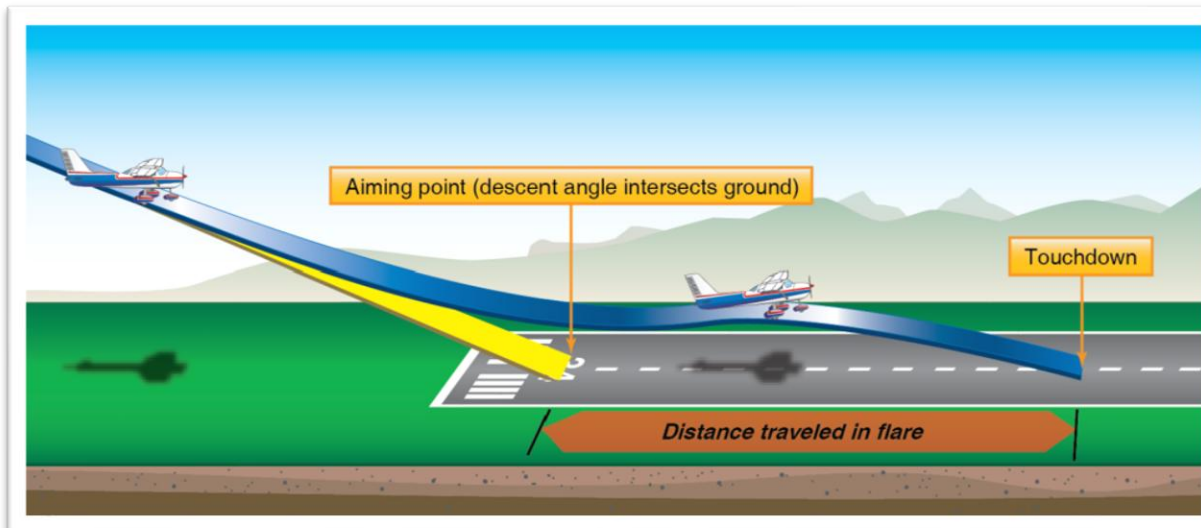
- **Enter Downwind at TPA (Traffic Pattern Altitude) at 45°**
- **Downwind Leg → 90kts (2100 RPM)**
 - 1,000ft AGL, parallel to the runway
 - Complete “Before Landing” **checklist** at the midpoint
 - Abeam the landing threshold: Reduce power (1600RPM), 1st notch of flaps (below 110kts), descent speed **80kts**
 - Generally, 45° angle from the threshold, turn to base
- **Base Leg → 70kts, 1500 RPM**
 - Crab into the wind (do it square)
 - 2nd notch of flaps (below 85kts)
 - **Check final is clear and turn to final**
- **Final Leg → 65kts**
 - **No more than 30° of bank in the pattern**
 - Align with the centerline, correct for wind, do not overshoot
 - 3rd notch of flaps (as needed), **Gear**, approach speed

- Use **Trim** throughout the procedure
- Wait until abeam of traffic on final before turning base
- Do not touchdown if there is an airplane in the runway (go around)
- Watch your airspeed!



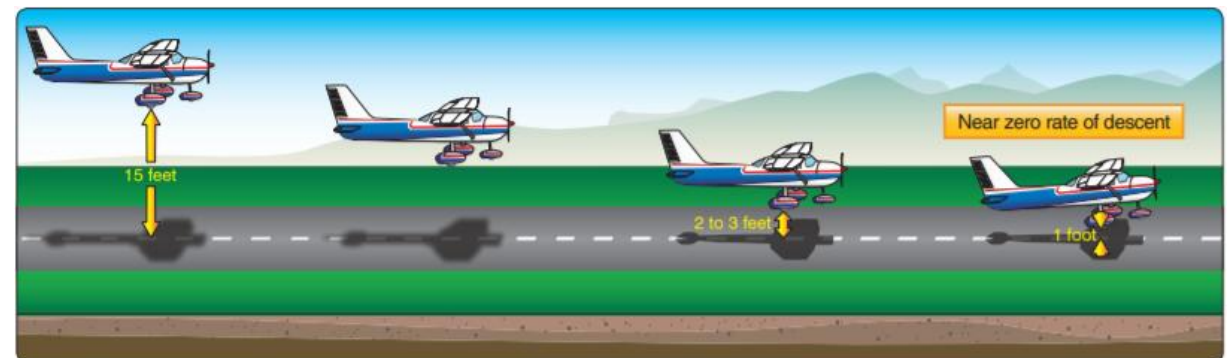
4. Final Approach

- **Stable Approach** – Constant glidepath (3^0) to a selected point on the runway
 - A stable approach is a safe approach → **Avoid step-downs**
 - Pitch for airspeed & Power for altitude to maintain a stable approach / glide path
 - A descent rate of **500 FPM** is at **65kts** is appropriate
- **Aim Point**
 - Select an aim point in-front of the desired touchdown point to allow for flare and float
 - Keep the aim point steady on the windscreen → Use small proactive corrections
 - **Roundout at the aim point** to drain airspeed and **flare for touchdown**



5. Roundout and Touchdown

- **Start the Roundout approximately 10-20' above the ground → Reduce power and gently increase pitch**
- **Decreasing lift, Increasing pitch**
 - As airspeed decreases, AOA is increased to allow the airplane to gently settle on the runway
 - If AOA is increased too rapidly → balloon // expect high sink – hold attitude + add a little power, or go around
 - If AOA is increased too slowly → land flat // it is unsafe (also NEVER land Nose First)
 - If airplane is too fast → expect Float
- **Touchdown**
 - Hold the wheels a few inches off the ground as long as possible → **Look towards the end of the runway**
 - Increase back pressure to gently allow the main wheel to touchdown, followed by the nose wheel
 - **NO side loads!** **Aileron** keeps the airplane on centerline. **Rudder** keeps the longitudinal axis aligned to the centerline
- **After Touchdown**
 - Maintain some back elevator
 - Apply brakes as needed
 - Steer with rudder and differential brake



6. Crosswind Landing

Crab Method

- Crab into the wind so the ground track remains aligned with the runway
- Maintain it until just prior to touchdown
- Align the longitudinal axis with the runway
- Less “stabilized” when rounding out



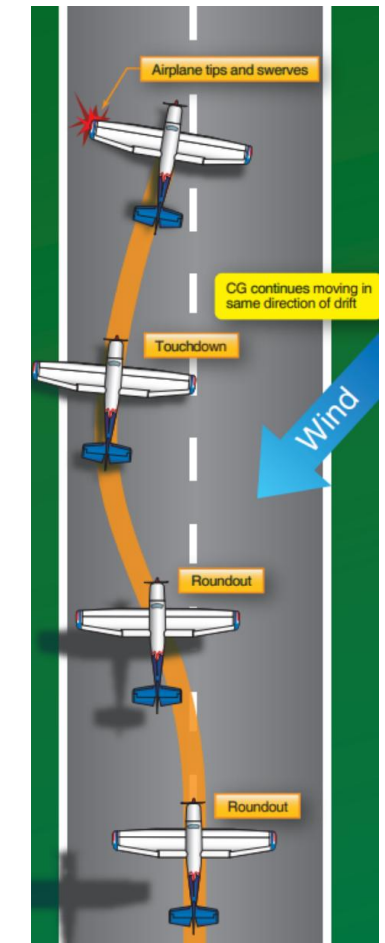
Sideslip Method

- Align the airplane with Rudder
- Bank the aircraft to keep it on centerline
- Increased drag, a little bit more power
- On Touchdown: upwind wheel touches first



Ground loop

Sideloads and/or improper wind correction may cause loss of control



7. Obstructions and Hazards

- **Strong, Gusty Winds**

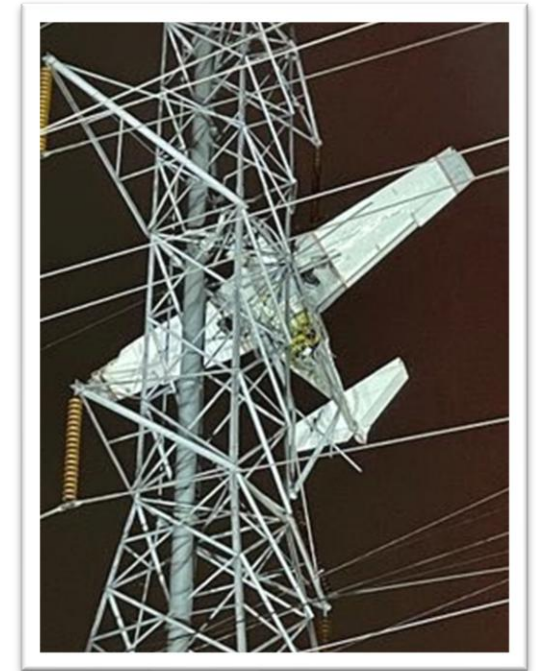
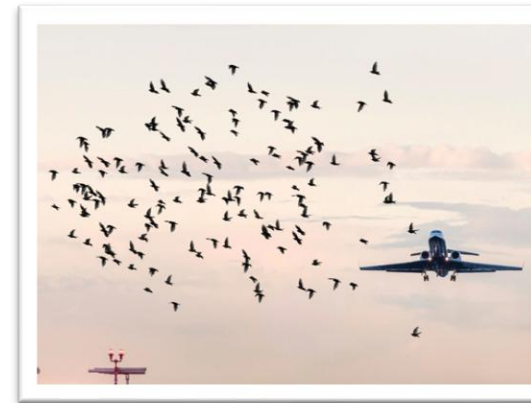
- Increase speed on final approach per the manufacturer's guidelines → Usually + half of the gust factor
 - *Example: Winds 8 gusting 20 knots → Gust factor = 12 → Approach airspeed $65 + 12/2 = 71$ kts*
- Use flaps as recommended in the POH → Often best to land with low flaps (10° or 20°)

- **Obstacles**

- Powerlines, Trees, towers, construction equipment, birds, animals in the runway, etc.
- Be aware of potentially hazardous obstructions and ensure airplane performance

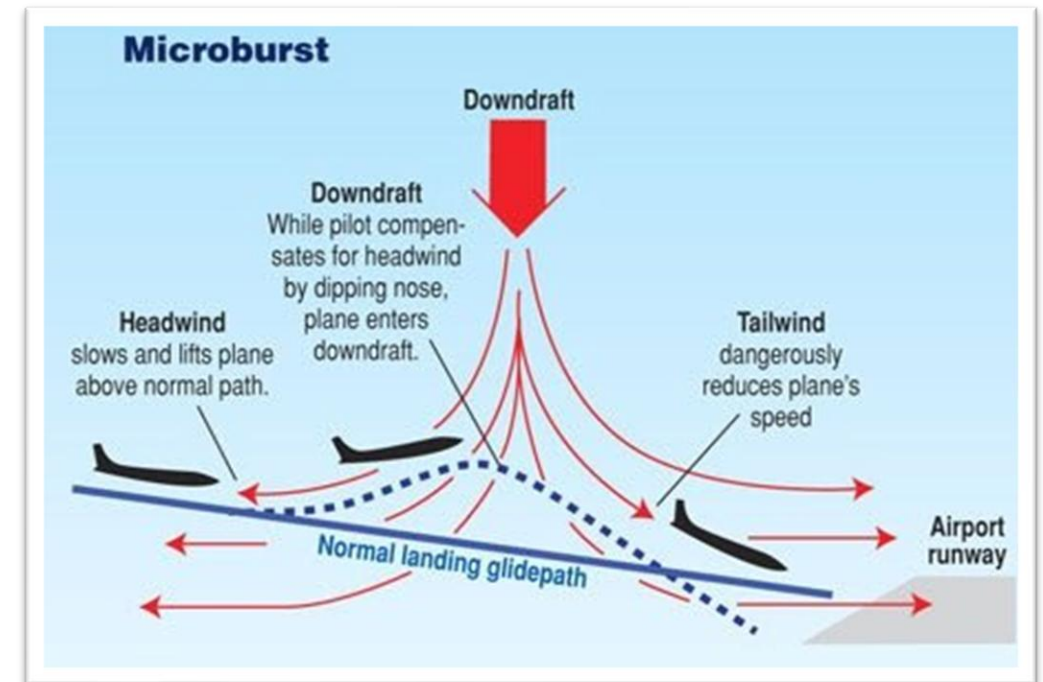
- **Traffic**

- Near airports is where most mid-air collisions happen
- Be aware of traffic → Particularly in uncontrolled fields
 - Is there an airplane extending upwind or downwind?
 - Any airplane on final? (e.g. in an instrument approach)
 - An aircraft joining the patterns?
 - Is there a helicopter in the pattern?
- Use radio calls and any other available tools to build a mental picture of traffic



8. Windshear

- **Windshear:** Sudden, drastic change in wind speed and / or direction over a very small area
- **Why is it Dangerous?**
 - Violent updrafts and downdrafts (up to 6,000 fpm)
 - Rapid changes in performance
 - **Microbursts** – Most severe type of windshear
 - 1-2 miles across, strong downdrafts
 - Gains / losses of 30 – 90 knots
 - Signs: virga at cloud base, blowing dust, PIREPs
- **Handling Windshear**
 - If possible, avoid it
 - General techniques include:
 - Higher power and faster approach; Stay as high as feasible until necessary to descend
 - Go-around at the first sign of windshear – Full power and establish a maximum performance climb



9. Wake Turbulence Avoidance

• Wake Turbulence

- Caused by wing vortices (worse in **heavy, clean, slow** aircraft)
- Rolling moments can exceed control authority of the aircraft

• Approach

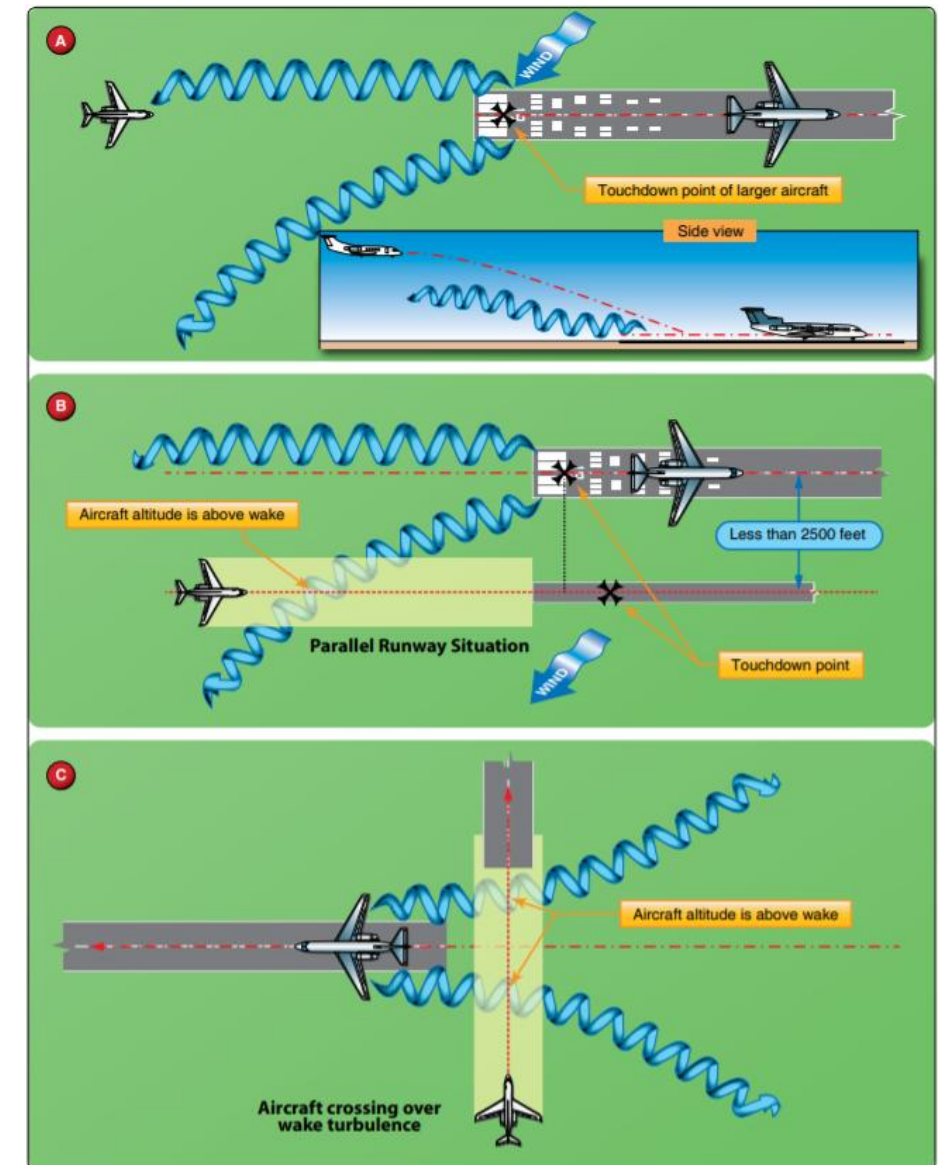
- Behind aircraft: **Stay at/above** their flight path
- On parallel runways: possibility of drift

• Landing

- Behind departing aircraft: **Land prior** to their rotation point
- Behind arriving aircraft: **Land beyond** their touchdown point
- Behind aircraft on a crossing runway: **Cross above** their flight path
- Aircraft executing a missed approach: **Wait at least 2 minutes**

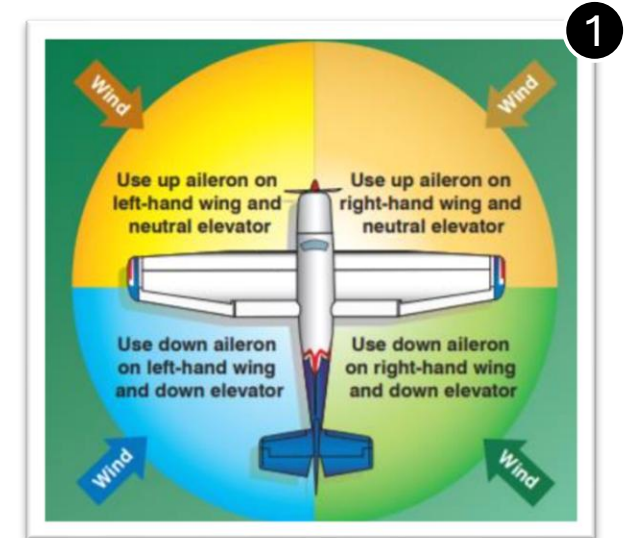
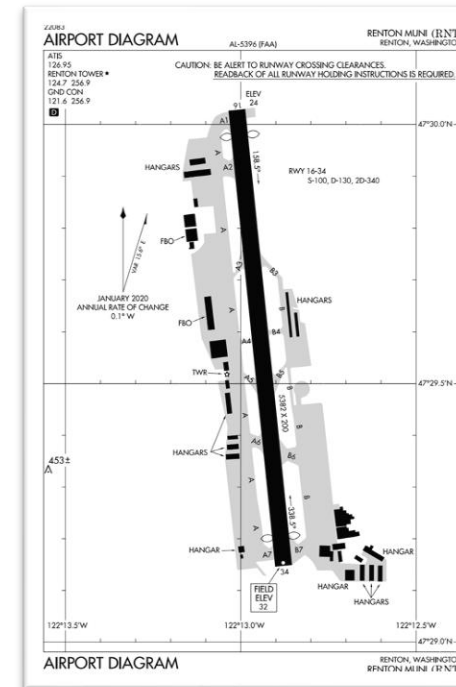
• Departing

- Behind aircraft: Rotate prior to rotation & climb above their flight path
- Intersection takeoff : Be alert to larger aircraft operations on runway
- Wait 2 minutes after a large aircraft executing a missed approach



10. Common Errors

1. Improper use of landing performance data and limitations
2. Failure to establish approach and landing configuration at appropriate time or in proper sequence
3. Failure to establish and maintain a stabilized approach
4. Inappropriate removal of hand from throttle
5. Improper procedure during roundout and touchdown
6. Poor directional control after touchdown ¹
7. Improper use of brakes (ASEL)
8. Failure to ensure receipt and acknowledgement of landing clearance
9. Failure to review airport diagram for exit and situational awareness to avoid a runway incursion after landing



Questions?

