Crosswind Guidelines

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Purpose

- Understand origin of crosswind guidelines
- Discuss crosswind values
- Discuss crosswind effects on high by-pass engine airplanes
- Review takeoff and landing techniques

Crosswind Guidelines

- Provided to assist operators develop crosswind policies
- No certification requirement
  - Maximum available during certification
- AFM "Demonstration"

M A X I M U M C R O S S W I N D (TYPICAL)

The maximum demonstrated crosswind component for takeoff and landing is 36 knots reported wind at 10 meter height. This component is not considered to be limiting on a dry runway with all engines operating.

Origin of Guidelines

- Light weight, AFT CG
  - Load on nose wheel
- Runway condition
  - Friction coefficient
- Tire side force capability
- Aerodynamic controls
  - Lateral/directional
- Engine out RTO
- Flight test data/analysis
- Simulator trials

Crosswind Guidelines (Typical)

757/767 Flight Crew Training Manual

Takeoff Crosswind Guidelines

Runway Condition	Crosswind—Knots
Dry	40
Wet	25
Standing Water/Slush	15
Snow - No Melting	20
Ice - No Melting	15

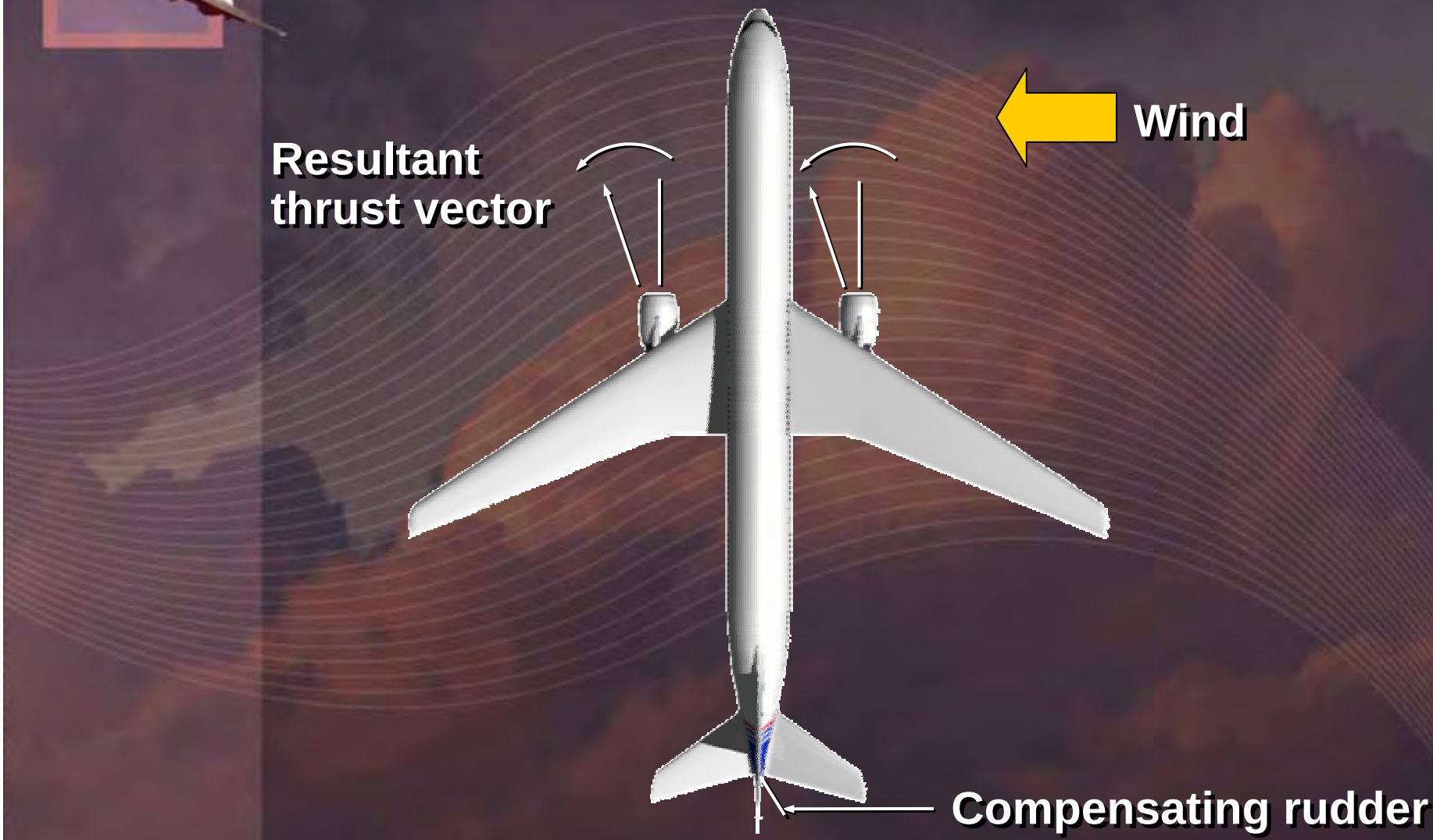
Landing Crosswind Guidelines

Runway Condition	Crosswind—Knots
Dry	40
Wet	40
Standing Water/Slush	20
Snow - No Melting	35
Ice - No Melting	17

Crosswind Takeoff

- Low speed/weight controllability most affected
- Tire side force capability limits crosswind
  - Side force affected by
    - Runway surface and contamination
    - Aft CG and lower GW
- Engine inlet distortion—high bypass ratio engines
  - Effect of crosswind entering nacelle turns airplane downwind
  - Most noticeable on 777

Effect of Crosswind on Engine Inlet



Crosswind Takeoff Techniques

- Rolling takeoff recommended
  - Minimizes disrupted airflow into engine
- Smooth application of thrust
- Light forward pressure on elevator
- Moderate aileron into wind
- Maintain centerline with rudder pedal steering and rudder
- Don’t preset rudder—anticipate rudder reversal

Crosswind Takeoff Techniques

(continued)

- Don’t use tiller past taxi speed

  (except some classic 747-100)

- Don’t rotate faster than normal

  – Tailstrikes

Crosswind Landing

- Pilot crosswind landing technique significantly affects crosswind capability
- Flight control aerodynamic forces and tire side-force are the limiting factors

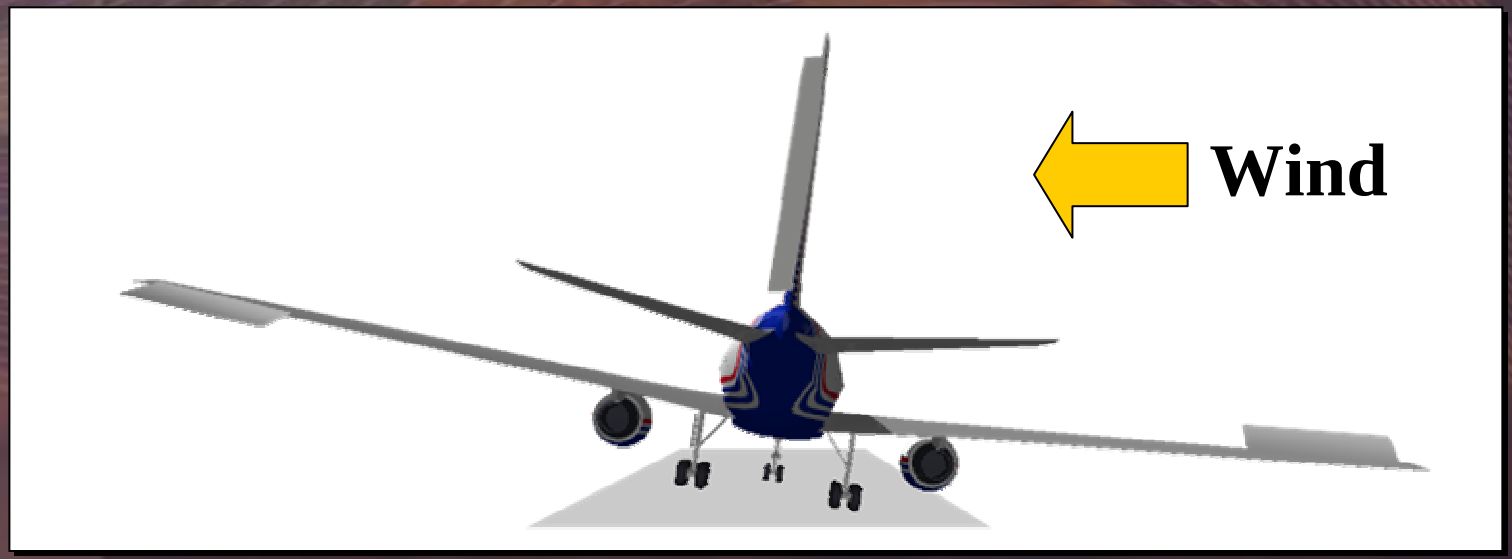
Crosswind Landing Techniques

- Side slip (wing low)
- Crab (to touchdown)
- Combination slip/crab
- Decrab during flare

Crosswind Landing Techniques

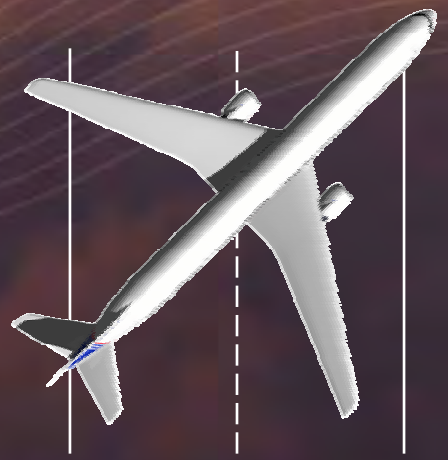
Side Slip (Wing Low)

- Upwind wing lowered into wind
- Opposite rudder maintains runway alignment
- Reduced x-wind capability



Crab (To Touchdown)*

- Airplane touches down in crab
- Flight deck is over upwind side of runway
  - Main gear is on runway center
- Airplane will decrab at touchdown
- Maintain directional control during roll out with rudder and aileron

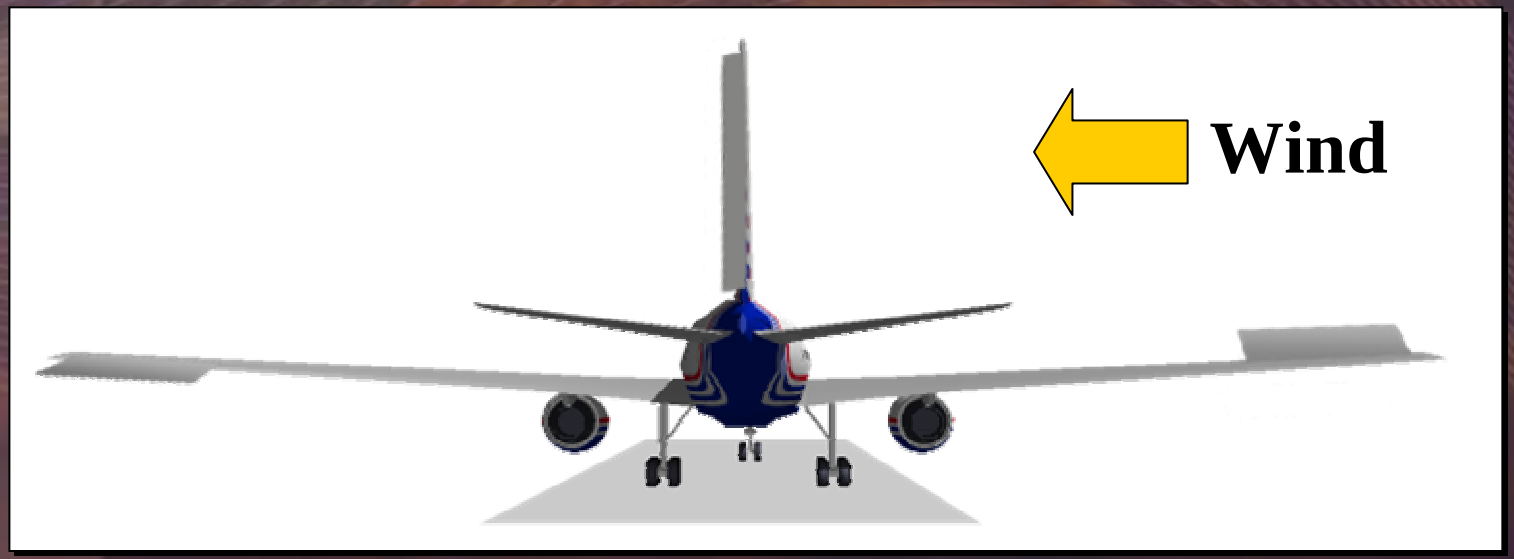


Wind

* Full crab not recommended for maximum crosswind on Long Beach products

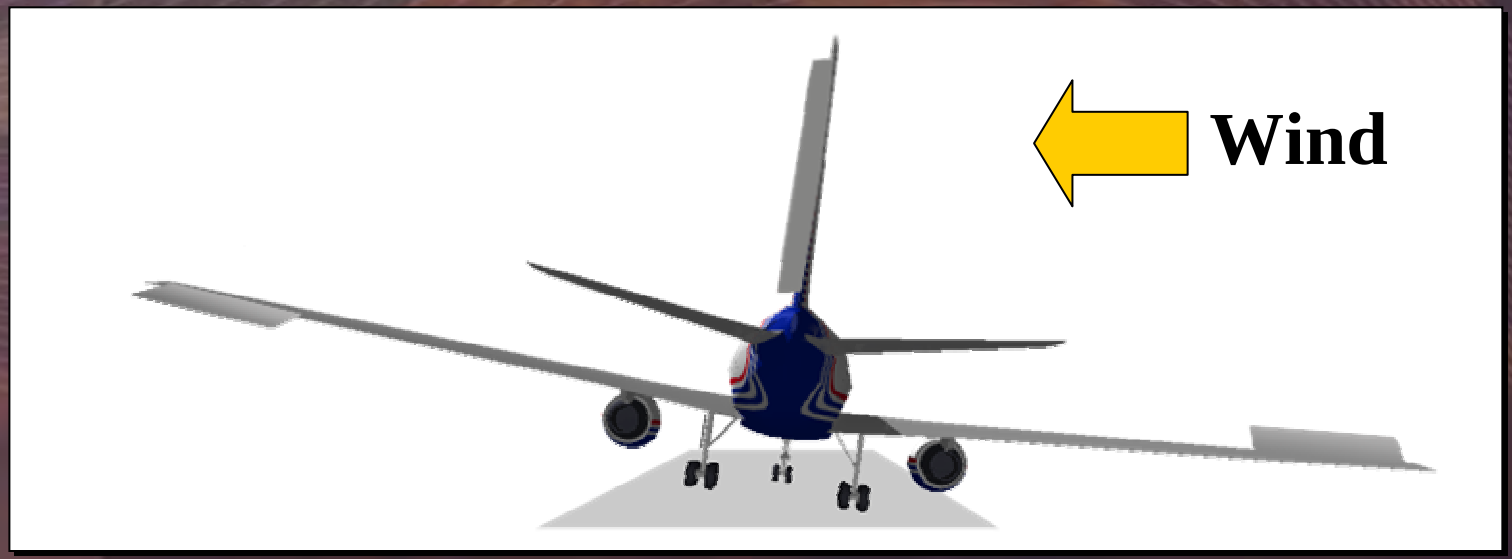
De-Crab During Flare

- Maintain crab on the approach
- During flare, apply rudder to align airplane with runway and opposite aileron to keep wings level



Combination Crab and Side Slip

- De-crab using rudder to align longitudinal axis with runway. Increase aileron to maintain wing low
- Touchdown on upwind tire, wing slightly low



Crosswind Guidelines

Side Slip (only)

- Side slip only technique reduces maximum crosswind capability
- Based on 2/3 control input criteria
- Remaining 1/3 control available for gust recovery

Crosswind Guidelines (continued)

Side Slip (only)

				Control Limit Sideslip Only Landing (2/3 lateral control (rolling moment) or 2/3 pedal input)							FCTM
Airplane	OEW	1.1* OEW	Flaps	Vref (1.1 OEW)	Sideslip	Bank	%Max Whl	%Max Rud	Crosswind	Control Limit Criteria*	Recommended Crosswind
	1000 lb	1000 lb		kts	deg	deg			kts		kts
747-200	380	418	30	121	7.9	4	44	40	16.6	2/3 Lateral Control	16
747-400	400	440	30	121	7.5	4.1	43	30	15.8	2/3 Lateral Control	16
767-200	180	198	30	117	11.7	Not det.	46	67	23.7	2/3 pedal	24
767-300ER	200	220	30	119	12.3	Not det.	48	67	25.4	2/3 pedal	24

Common Questions

- Airplane crosswind structural design
- Auto land limitations
- Disconnection of autopilot for manual crosswind landings
- Auto throttle use in strong gusty crosswinds
- Pure crosswind wind additives to Vref

Crosswind Landings - After Touchdown

- Idle thrust
- Deploy reversers normally
  - Slippery/contaminated runways
- Check speedbrakes up
- Maintain aileron into the wind to keep wings level
- Smoothly but positively lower the nosegear
- Rudder control effective to about 60 knots
- Rudder pedal steering sufficient until taxi speed
- Use asymmetrical braking if necessary
- Use tiller upon reaching taxi speed

Crosswind Landings

- Common Problems
  - Unstable approaches
  - Holding airplane off until below Vref
  - Bounced landings
- Alternatives
  - Go around
    - Be careful not to over-rotate during rejected landing
    - Terrain clearance and missed approach procedure
  - Wait or divert
- Training
  - How does your airline approach crosswind training?
  - Recurrent training plans?
  - Are your pilots maintaining proficiency?

Crosswind Guideline Summary

- Guidelines not limits
- Airline can use guidelines to establish company policies
- Runway condition affects crosswind capability
- Most gust conditions have minor affect on crosswind capability
- Landing crosswind technique affects crosswind capability