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”

MAXIMUM CROSSWIND (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

<table>
<thead>
<tr>
<th>Runway Condition</th>
<th>Crosswind—Knots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry</td>
<td>40</td>
</tr>
<tr>
<td>Wet</td>
<td>25</td>
</tr>
<tr>
<td>Standing Water/Slush</td>
<td>15</td>
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<td>20</td>
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</table>

### Landing Crosswind Guidelines

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<td>17</td>
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</tbody>
</table>
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

Resultant thrust vector

Compensating rudder

Wind
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

* 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)

<table>
<thead>
<tr>
<th>Airplane</th>
<th>OEW</th>
<th>1.1* OEW</th>
<th>Flaps</th>
<th>Vref (1.1 OEW)</th>
<th>Sideslip</th>
<th>Bank</th>
<th>%Max Whl</th>
<th>%Max Rud</th>
<th>Crosswind</th>
<th>Control Limit Criteria*</th>
<th>Recommended Crosswind</th>
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<td>380</td>
<td>418</td>
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*FCTM refers to Flight Crew Training Manual.*
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