

# Control Tower Procedures

Nolan, Chap 6



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## Control Towers

- Responsibilities:
  1. Ensure sufficient runway separation exists between aircraft landing and departing
  2. Relaying IFR clearances
  3. Providing taxi instructions
  4. Assisting airborne aircraft in vicinity of airport
- Tasks performed using two-way radio equipment
- Operated by FAA and non-federal agencies

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## Categories of Control Towers

- VFR Towers
  - NOT delegated separation responsibility
    - Except initial departure traffic
  - ARTCC separates IFR traffic
- Non-radar-approach control towers
  - Delegated IFR separation responsibility
  - Located in tower cab
  - Separate aircraft using non-radar procedures
- Radar-approach control towers
  - Delegated IFR separation responsibility
  - Located at base of tower
  - Separate aircraft using radar procedures

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## Personnel and Duties in Control Tower

- Duties:
  1. Flight Data
  2. Clearance Delivery
  3. Ground Control
  4. Local Control
- Busy airports one controller for each task
- Less busy airports one controller does more than one task

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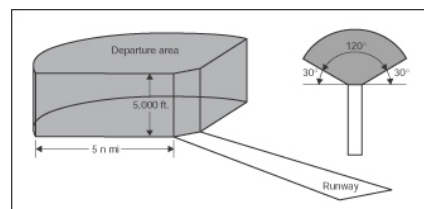
# 1. Flight Data Controller

- Performs clerical duties
  - Receives and relays IFR departure clearances to Clearance Delivery controller
    - Clearances from ARTCC arrive by telephone (or automated procedures)
    - Clearances written/printed on Flight Strips
  - Operating the Flight Data Processing Equipment
  - Relaying Weather and NOTAM information to other positions
    - Perform weather observations
    - PIREPS – Pilot Reports of actual conditions
    - ATIS – Automatic Terminal Information System
      - Looping tape recorded message broadcast on Frequency
  - Collecting, tabulating and storing daily records
  - Preparing ATIS recording
  - Processing field condition reports

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# 2. Clearance Delivery Controller

- Obtaining, relaying or amending clearances
- Clearance:
  - Aircraft Identification Number
  - Clearance Limit
  - Departure Procedure
  - Route of Flight
  - Altitude
  - Departure Frequency
  - Transponder Code
- Airspace designed with Departure Area:
  - Upto 5,000', 40° to 180°
- Once aircraft departed, contact departure controller



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### 3. Ground Controller

- Responsible for safety of aircraft taxiing on taxiways or inactive runways
- Only in areas where traffic can be observed from Control Tower
- Aircraft location determined by:
  - Visual observation, pilot report, airport surface radar
- Positive instructions:
  - Aircraft Identification
  - Name of ground controller facility
  - Route to be used for taxi

“United 2-1-4-Pappa-Alpha, taxi to runway 3-5 via taxiway Bravo and Charlie

  - Note: Never uses the word “cleared”
- Runway incursions

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### 3. Ground Controller



KORD Airport Diagram  
Figure 6-4, page 231

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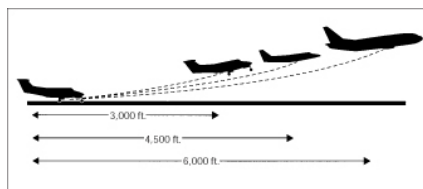
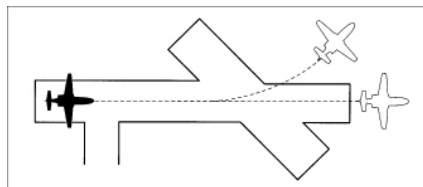
## 4. Local Controller

- Safely sequence arrivals and departures
  - Issues instructions for *runway* separation
    - Not VFR aircraft inbound to the airport
- Runway Separation Rules
  - 3 Categories of Aircraft
    - Cat 1 – most single-engined aircraft
    - Cat 2 –lightweight twin-engine
    - Cat 3 – all other

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## 4. Local Controller (cont.)

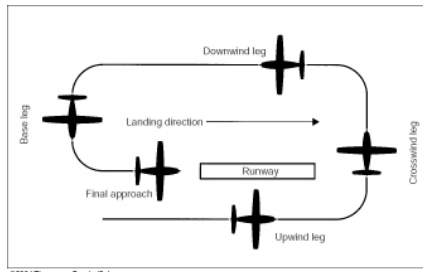
- Departing aircraft separation:
  - Preceding arriving aircraft has taxied off runway
  - Preceding departing aircraft is airborne, crossed the departure end of runway, and distance (Cat 3 aircraft) 6000'
- Anticipated separation
  - Assumes delays in aircraft positioning or pilot actions will result in required separation



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## 4. Local Controller (cont.)

- Arriving Aircraft Separation
  - VFR – standardized traffic pattern
- Arriving aircraft does not cross the landing threshold until:
  - Preceding arrival has taxied off the runway
  - Preceding departure crossed departure end of runway (or airborne and distance)



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## 4. Arrival Spacing Instructions

- Extend downwind
  - Trombone
- Short Approach
  - Shorten downwind leg
- Make Left/Right
  - S-turns to lengthen
- Go Around
- Cleared to Land

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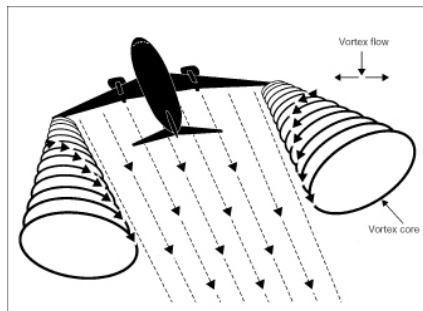
## Land and Hold Short Operations (LAHSO)

- Improve runway throughput
  - Eliminate crossing runways
- Aircraft cleared to land and hold short of intersecting runway (or taxiway)
- Pilots accept/reject LAHSO clearance
  - Pilot in command has final authority

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## Wake Turbulence

- Wake Turbulence
  - Prop wash
  - Wake from fuselage
- Wake Vortex
  - Counter-rotating vortices from wing-tips
  - Produced by lift generated by wing
    - Low pressure above wing, High pressure below wing

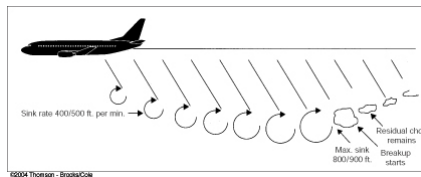
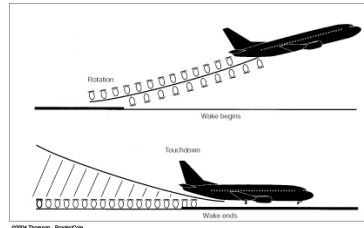


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# Wake Vortex Dynamics

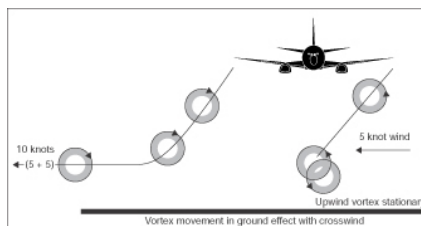
- Strength of vortex determined by:
  - Weight (heavier)
  - Speed (slower)
  - Shape of wing
- Rotational velocity of vortex
- Vortex dynamics
  - Descend 500 feet per minute until 900' below aircraft
  - Remain at 900' until dissipate
  - If contact ground, move outward at 5 knots



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# Wake Vortex and Crosswind

- Crosswind
  - Increases speed of outward movement of downwind vortex
  - Slows speed of outward movement of upwind vortex
    - 3 – 7 knot prevents upwind vortex from moving (sits on runway until dissipates)



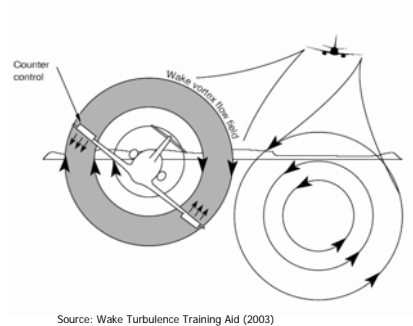
5 knot crosswind (landing aircraft)

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# Wake Vortex Encounter

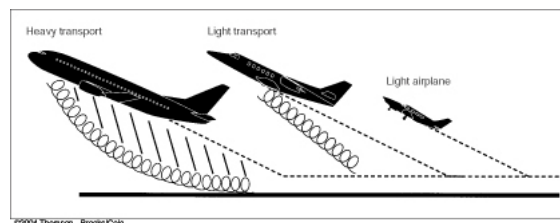
- Trailing aircraft encountering wake vortex:
  - experience induced roll
    - intensity of vortex forces roll moment
  - not easily corrected
    - can exceed roll authority of the aircraft
  - leads to loss of altitude
    - roll results in loss of Lift



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# Wake Vortex – Takeoff Procedures

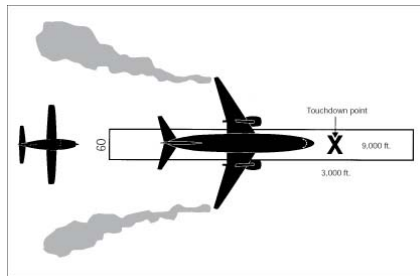
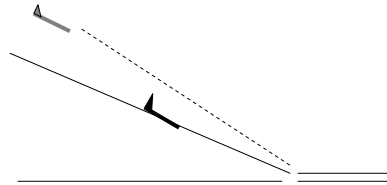
- Follow aircraft departure delayed 2mins behind heavy
- Aircraft departing behind a large or heavy
  - Rotate (start to climb) before preceding aircrafts rotate point
  - Climb at greater angle (or turn upwind)



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## Wake Vortex – Arrival Procedures

- VFR:
  - Approach
    - Follow aircraft remain above flight path of lead aircraft
    - land beyond touchdown point of lead aircraft



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## Wake Vortex - Arrival Procedures

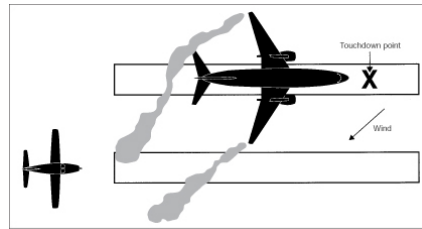
### FAA IFR Wake Vortex Arrival Separation Standards

- Heavy – Small: 6nm
- Heavy – 757: 5nm
- Heavy – Large: 5nm
- B757 – Small: 5nm
- Heavy – Heavy: 4nm
- B757 – Large: 4nm
- Large – Small: 4nm

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## Wake Vortex – Takeoff/Landing Procedures

- Aircraft landing on parallel runways
  - < 2500 feet between runways
  - Wake vortices drift in crosswind
- Procedure
  - Follow aircraft rotate prior to rotate point of lead aircraft on other runway



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## Chap 6 – Control Tower Procedures

1. Define the 4 duties of controller(s) in a Control Tower
2. Describe how the Local Controller separates departing aircraft
  - Constraints
  - Rules
3. Describe how the Local Controller separates arriving aircraft
  - Constraints
  - Techniques
  - Rules
4. Describe Land and Hold Short Operations

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