Control Tower Procedures
Nolan, Chap 6

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
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

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
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

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
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
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

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
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)

4. Arrival Spacing Instructions

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

Wake Turbulence

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

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)
Wake Vortex – Arrival Procedures

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

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
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

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