Learning Objectives

- Part 1 Background of the Industry
  - US Airport System
  - Airport Capitol Improvement Funding
- Part 2 Airport Planning
  - Airport Master Plan
  - Airport Layout Plan
  - Wind Rose Analysis
  - Runway Designation (Homework Problem)
- Part 3 Design Guides
  - Advisory Circular 150/5300-13
  - Federal Aviation Regulations Part 77
- Part 4 Construction
Part 1 Background of the Industry

- US Airport System
- Airport Improvement Funding
US Airport system

- Commercial Airports are used for...
  - Travel for Business and Travel
  - Cargo
  - Some Private Pilots
- General Aviation Airports are used for...
  - Emergency Services
  - Connect rural communities
  - Used mostly by Private pilot
  - Recreation use
30 Hub Airports
550 Commercial Airports
5,300 Public Use Airports
Growth of Passenger Air Travel

Traffic Is at a Cycle Trough
World traffic in RPKs, billions
4,000

4,000
3,000
2,000
1,000

Boeing Current Market Outlook 2003, Demand for Air Travel
Global growth projection in passenger travel

Global passenger air travel, 1990-2030

Greater delays as a result of growth.
Growth of Private Business Jets

- Fixed Wing Aircraft
- Flight Departments
- Fractional Shares
- Fractional Aircraft
Funding of Airport Projects

- Funding Stakeholders include
  - Federal Government – FAA
  - State Government
  - Local Government – County and City
  - The Airport
FAA Funding

- FAA currently funds up to 95% of Airport Capital improvements for General Aviation (GA) airports and 93.75% for international airports
  - Runway, Taxiway and Aprons
  - NavAids
  - Limited funding for revenue sources.
    - Terminals, Fueling Stations, Hangars.
Other Funding

- 2004 Nevada Aviation Trust Fund
  - Intended to match FAA Funding
  - Used for General Aviation Airports only
- Local funding
- Airport Funding
  - Passenger and Facility Fees, Cargo Taxes, Fuel Taxes
Airport Improvement Program (AIP)

- Airport Capital Improvement Program (ACIP)
- FAA Grants
  - Design
  - Construction
### Examples of Eligible vs Ineligible AIP Projects

<table>
<thead>
<tr>
<th>Eligible Projects</th>
<th>Ineligible Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway construction/rehabilitation</td>
<td>Maintenance equipment and vehicles</td>
</tr>
<tr>
<td>Taxiway construction/rehabilitation</td>
<td>Office and office equipment</td>
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<tr>
<td>Apron construction/rehabilitation</td>
<td>Fuel farms</td>
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<tr>
<td>Airfield lighting</td>
<td>Landscaping</td>
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<tr>
<td>Airfield signage</td>
<td>Artworks</td>
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<tr>
<td>Airfield drainage</td>
<td>Aircraft hangars</td>
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<tr>
<td>Land acquisition</td>
<td>Industrial park development</td>
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<tr>
<td>Weather observation stations (AWOS)</td>
<td>Marketing plans</td>
</tr>
<tr>
<td>NAVAIDs such as REILs &amp; PAPIs</td>
<td>Training</td>
</tr>
<tr>
<td>Planning studies</td>
<td>Improvements for commercial enterprises</td>
</tr>
<tr>
<td>Environmental studies</td>
<td>General Aviation Terminal Buildings</td>
</tr>
<tr>
<td>Safety Area improvements</td>
<td>Automobile parking lots</td>
</tr>
<tr>
<td>Airport Layout Plans (ALPs)</td>
<td>Maintenance or repairs of buildings</td>
</tr>
<tr>
<td>Access roads only located on airport property</td>
<td></td>
</tr>
<tr>
<td>Removing, lowering, moving, marking, and lighting hazards</td>
<td></td>
</tr>
</tbody>
</table>
Yearly AIP Authorizations and Appropriation Limitations

Fiscal Years

Congressional Authorization
Appropriations Act Limitation on Obligations
Funding for Airport and Airway Trust Fund

- Passenger and Facility Fees
- Cargo Taxes
- Fuel Taxes
Part 2 Airport Planning

• Airport Master Plan
• Airport Layout Plan
• Wind Rose Analysis
• Runway Designation (Homework)
Elements of an Airport Master Plan

- Airport Master Plan
  - Environmental Considerations
  - Existing Conditions
  - Aviation Forecast*
  - Facility Requirements
  - Alternatives Development and Evaluation
  - Airport Layout Plans*
  - Facilities Implementation Plan
  - Financial Feasibility Analysis

*Approved by the FAA
Airport Layout Plans Drawing Set

1) Airport Layout Plan*
2) Data Sheet
3) Terminal Area Plan (s)
4) Airport Airspace Drawing (FAR Part 77)
5) Inner Portion of the Approach Surface Drawing
6) Airport Land Use Drawing
7) Airport Property Map
Wind Rose Analysis

- Used to determine optimal placement of runways
- If wind coverage of 95% for 10.5 knot wind can be achieved no cross wind runway is needed.
- Indicates probability of safe landings.
Runway Designation

- Runway Placement
  - Constrained By Land and Wind
- 1<sup>st</sup> Convert to Degrees
- 2<sup>nd</sup> Adjust for Magnetic Variance
- 3<sup>rd</sup> Divide the bearing by 10
- 4<sup>th</sup> Round to the nearest whole number (if the answer is 0 use 36)
- If there are multiple runways designate Right or Left
Angle Conversion

- The runway bearing is typically reported as a Bearing Angle
- Runway Designation uses the Azimuth Angle
Runway Designation Example

• Problem
  • A proposed runway is determined to be N54°30′W, With a magnetic variance of 14°45′ West and an annual rate of change of 10′ East.

• Solve
  • What should the runway designation be?
Solution

1. N54°30’W Bearing Angle => 305.50° Azimuth Angle
2. -14.75 Magnetic Variance
   305.50° - 14.75° = 290.75°
3. Divide the Bearing by 10
   290.75° / 10 = 29.075
4. Round to the nearest whole number
   29.075 => 29
5. Runway designation  11-29
Part 3 Design Guides

• Advisory Circular 150/5300-13

• Federal Aviation Regulation Part 77
Types of Design Standards

• **Federal Aviation Regulations** (FAR’s) are organized by “parts” and are federal laws under chapter 14 of the Code of Federal Regulations (CFR’s)

• **Advisory Circulars** (AC) are a systematic means of providing non-regulatory information in a variety of subjects areas cataloged by number.
FAA Design Guides

• Found on FAA website

• AC 150/5300-13 Airport Design
• AC 150/5320-6D Airport Pavement Design and Evaluation
• AC 150/5340-1H Airport Markings
• FAR Part 77
Airport Layout And Design

- **Design Reference Code**
  - Wing span of Design Aircraft
    - A through E (A is small, E is large)
  - Approach speed of Design Aircraft
    - I through VI (I is slow, VI is fast)

- **Example**
  - Reno Runway 34L-16R, D-IV
  - Stead 8–26, C-II
  - Carson 9-27 B-II
Airport Layout And Design

- Runway Design
  - Runway Length and Width
  - Runway Shoulders
  - Safety areas
- Taxiway Design
  - Taxiway Width
  - Shoulders
  - Wing Tip Clearance / Safety Areas
  - Location of Hold Bars
Airport Layout And Design

• Safety Areas
  • Runway Safety Area (RSA)
  • Taxiway Safety Area (TSA)
  • Object Free Zone (OFZ)
  • Object Free Area (OFA)
  • Runway Protection Zone (RPZ)
  • Visual Restriction Line (VRL)
  • Building Restriction Line (BRL)
Striping

- Runway
  - Visual, Non-Precision, Precision
- Centerline
- Hold Bar
- Closed Runway
Runway Striping

Figure 1. Precision Runway Markings

Figure 2. Nonprecision Runway and Visual Runway Markings
Striping

- Hold Sign Striping

- Runway Closed Striping (Permanent)
Signing

- Runway or Taxiway designation sign
- Hold Sign
- Directional Signs
Signing

- Runway Holding Position Sign
  
  15-33

- Direction Sign For Runway Exit
FAR Part 77

• The Definition of Controlled Airspace Around an Airport
• Any Object located inside the Defined Surfaces is considered an obstruction

http://www.ngs.noaa.gov/AERO/oisspec.html
FAR Part 77
3-D Drawing

- Conical Surface
- Precision Instrument Approach
- Visual or Non Precision Approach (Slope - E)
- Horizontal Surface 150' Above Established Airport Elevation
- Runway Centerlines
## OBSTRUCTION IDENTIFICATION SURFACES
### FEDERAL AVIATION REGULATIONS PART 77

<table>
<thead>
<tr>
<th>DIM</th>
<th>ITEM</th>
<th>VISUAL RUNWAY</th>
<th>NON - PRECISION INSTRUMENT RUNWAY</th>
<th>PRECISION INSTRUMENT RUNWAY</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
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<tr>
<td>A</td>
<td>WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END</td>
<td>250</td>
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<tr>
<td>B</td>
<td>RADIUS OF HORIZONTAL SURFACE</td>
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<td>D</td>
<td>APPROACH SURFACE LENGTH</td>
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<td>E</td>
<td>APPROACH SLOPE</td>
<td>20:1</td>
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</table>

- **A** - UTILITY RUNWAYS
- **B** - RUNWAYS LARGER THAN UTILITY
- **C** - VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
- **D** - VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
- **'** - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET
Part 4 Construction

- Construction Management
- Construction Safety
Construction Management

- Preconstruction meeting
- Material submittals
- Weekly construction meetings
- Construction reports
- Construction issues
- Pay requests
- Change orders
- Construction Inspection
- Materials Testing
Construction Safety

- NOTAMS – Notice to Airmen
  - Used to close the portions of the airfield under construction
- Temporarily Close Runways and/or Taxiways
- Commercial Airports Require Security Badging for all personnel on the airfield.
- Vehicular Traffic
  - Checkered Flags, Amber Lights, Radios
## International Civil Aviation Organization (ICAO) Phonetics

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WE HAVE JUST COMPLETED THE FIRST FLIGHT OF THE WORLD'S LARGEST JET. 800 PASSENGERS HAVE FLOWN IN ULTRA COMFORT AND CONVENIENCE.
Thank You
Trent Baldwin & Jim Clague of PBS&J
775-828-1622