Purpose of this Presentation

• To explain FAA concepts regarding airfield operations
  – Evolution of Airfield Layout and Runway Use
  – Converging Runway Operations (CRO)
  – Runway Incursions and Hot Spots

• To discuss how the CDA is addressing these concepts, policies, and procedures with changes at O’Hare International Airport (ORD)
Airfield Layout

- Airfield layouts can be categorized as: (1) intersecting, (2) converging, and (3) parallel.
- Intersecting and converging runways are less ideal as they involve additional safety concerns and result in reduced operational efficiency.

Intersecting Runways

Converging Runways

Parallel Runways

Note: Green runways indicate the original “runway triangle” airfield.

Parallel runways are ideal because they can permit independent operations under most weather conditions.

Source: Landrum & Brown
Evolution of the ORD Airfield

<table>
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<th>Orchard Field - 1946</th>
<th>ORD - 1996</th>
<th>OMP Airfield - 2021</th>
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- 4 runway orientations
- High Wind Coverage
- Low Peak Hour Capacity
- No Dual Approaches
- Limited Aircraft Crosswind Tolerance

- 3 sets of Dual Parallel Runways
- High Wind Coverage
- Dual IMC Approaches
- Triple VMC Approaches
- Relies on Converging Operations

- 6 parallel east-west runways
- One pair of crosswind runways
- Triple IMC Approaches
- Triple VMC Approaches
- Balanced IMC/VMC Performance

O’Hare’s runway layout has evolved with improvements in aircraft and air traffic control technology

Source: Landrum & Brown
Evolution in ORD Runway Use

Pre-OMP Airfield

- Use of Intersecting Runways
- Dynamic Runway Use
- Mixed Operations
- Imbalance in VMC/IMC Performance
- Shorter Taxi Routes
- Higher Delays

OMP Airfield

- Dedicated Runway Use
- Balanced East-West Performance
- Balanced VMC/IMC Performance
- Longer Taxi Routes
- Lower Delays

Note: Diagrams are examples and do not reflect all operational configurations

The OMP airfield provides increased balance, all-weather reliability, and enhanced peak hour throughput

Source: Landrum & Brown
Parallel Runway Operations

• Closely spaced parallel runways typically operate with arrivals assigned to the outboard runway and departures assigned to the inboard runway
• This runway use is more efficient and reduces controller workload
• Requires arrivals to cross the inboard departure runway when taxiing to the gate

End-around taxi procedures allow airports to avoid all runway crossings, thus reducing the likelihood of a runway incursion

Source: Landrum & Brown
Parallel Runway Operations – End-Around Taxi Patterns

Runway 10L intersection departures allow Runway 10C and 10R arrivals to reach the terminal without crossing Runway 10L.

Source: Landrum & Brown
Converging Runway Operations
ORD Airfield Layout Changes

Original airfield layout had 8 runway intersections; future layout only has 3 intersections.

ORD is transitioning towards a more favorable system of parallel runways.

Source: Landrum & Brown
Converging Runway Operations (CRO)

- January 15, 2014: FAA implemented new rules that create safe separation between converging flight paths – affecting many airports including BOS, CLT, IAD, IAH, JFK, LAS, ORD, and others
- Issue: potential conflict between a departing aircraft and an arriving aircraft that executes a go-around on converging non-intersecting runways
- CRO procedures require the departure to be held until the arrival has reached a point where it cannot conflict with the departure

Parallel Runway Operations are more efficient than Converging Runway Operations

Runway 14R/32L Impacts

• Because of CRO procedures, Runway 14R/32L provides limited utility in the parallel runway system during daytime hours

• The compatible land use corridor to the northwest can be used for nighttime operations without the use of Runway 32L

• Runway 14R/32L interferes with western access as proposed by the Illinois Tollway

“This [Runway 32L departures] is almost impossible to manage during busier arrival traffic periods.

Runway 14L/32R intersects two other runways... This precludes use of Runway 14L/32R simultaneously with those runways in either a full west or east flow operation, unless traffic on the other two runways are held.”

JDA Aviation Technology Solutions, O’Hare Crosswind/Diagonal Runway Layout and Usage, June 3, 2015.
The South Airfield is a mostly parallel system while the North Airfield still has multiple runway dependencies.
FAA Converging Runway Display Aid (CRDA)

• CRDA is used for CRO operations when a departing aircraft is held on Runway 32L and another aircraft is landing on 27R, a non-intersecting converging runway.

• An automated computer program creates an image of a “ghost” aircraft on the converging runway’s flight path as a visual cue to ensure proper separation.

• CRDA is used to prevent the premature release of the 32L departure, thereby avoiding a possible conflict if the arriving aircraft executes a go-around procedure.

27R arrival go-around conflicts with 32L departure

CRDA allows for marginal increased use of Runway 32L, but still reduces throughput relative to parallel operations and is infrequently used.
Use of Runway 14R/32L Reduced Substantially after CRO

Runway 32L Average Daily Departures

Runway 9L-27R Opened November 20, 2008
Runway 32L Shortened to 9,685’ on May 6, 2010
CRO Rule Takes Effect April, 2014
Runway 32L Closed for Taxiway Construction April, 2015

Average Departures

Month
Runway Incursions and Hot Spots

Runway Incursion

• “Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take off of aircraft”

• Example: aircraft or vehicle accidentally crossing an active runway

• The FAA has a renewed focus on reducing runway risks and started the Runway Incursion Mitigation (RIM) program in June 2015

Hot Spots

• “A location on an airport movement area with a history of potential risk of collision or runway incursion and where heightened attention by pilots and drivers is necessary”

The FAA has a renewed focus on mitigating runway incursions

ORD Hot Spots

- ORD has seven hot spots, two of which are associated with Runways 14L/32R and 14R/32L.

Source: Jeppesen Airway Manual, September 2015

Decommissioning Runways 14/32 will address two hot spots at ORD
Conclusion

• Recently imposed CRO policies and procedures enhance safety but reduce efficiency

• Parallel runways result in a more efficient operation when compared with intersecting or converging runways

• Decommissioning of Runways 14L/32R and 14R/32L allows ORD to operate more efficiently in a mostly parallel configuration and eliminates two hot spots

• CRDA is a good interim solution for CRO but changing airfield geometry will comply with recent FAA requirements and optimize airfield operating efficiency

• CDA will continue to explore ways to reduce nighttime noise exposure and to further enhance operational efficiency at ORD
THANK YOU!
Acronyms

• AAR: Airport Arrival Rate
• CDA: Chicago Department of Aviation
• CRDA: Converging Runway Display Aid
• CRO: Converging Runway Operations
• FAA: Federal Aviation Administration
• IMC: Instrument Meteorological Conditions
• OMP: O’Hare Modernization Program
• ORD: O’Hare International Airport
• VMC: Visual Meteorological Conditions