Quick-look CDA Analysis for the JPDO EAD

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• JPDO Context
• Supporting Techniques
• Near-term CDA Modeling Approach
• Discussion of Key Questions
JPDO Context
Portfolio Analysis Environmental Modeling

- Overall goal of portfolio analysis is quantifying benefits of key NGATS capabilities. As part of this, show the potential results of NGATS on the environment.
  - Enroute and Terminal Area procedural changes
  - Airport surface improvements
  - Aircraft technological improvements

- Explicitly model portfolio capabilities in the terminal area (Enroute and surface improvements will be captured from the operational modeling)
  - Continuous Descent Approaches (CDA), Required Navigational Performance (RNP)
  - For CDA work, have October deadline for 35 OEP airports as initial effort

- Use good weather scenario (VMC conditions) from ACES runs that represent Portfolio Segments 3 and 7 with and without NGATS implementation.
Portfolio Analysis Environmental Modeling (Cont’d)

• Noise
  – National results for the top 100 airports within the continental United States
  – Aggregate and airport-specific calculations showing population impacted by 55 DNL and greater

• Emissions
  – National results for the top 100 airports within the continental United States
  – Aggregate and airport specific, calculations showing primary emission burdens (HC, CO, NOx, and SOx).

• Fuel Efficiency
  – National results for flights to/from top 100 airports within the continental United States
Portfolio “Operational Improvements” (OIs)

- **Segment 3 (~2015)**
  - OI 0:106, 1:107, 2:109 - RNP routes are available to/from all runway ends at OEP airports. Assume RNP .15 is based on the need for closely spaced parallel runway operations; however FAA is requiring an RNP .3.
  - **OI 0:75, 1:76, 2:81 – Near-term new operational procedures implementation (e.g., Continuous Descent Approach - CDA) at target airports and advanced procedures development, with a particular focus on low noise approaches (in low to heavy traffic situations).**
  - OI 1:78, 3:83 – Noise- and emissions-favorable RNAV/RNP routes are used at OEP airports.
  - OI 1:80 – Evaluate potential for noise-favorable routes over a select number of national parks, using advanced air traffic control technologies and avionics.
  - OI 3:82 - Initial integration of latest technically-feasible, environmentally-enhanced technology into the fleet and operations.
Portfolio Capabilities

- **Segment 5 (~2020)**
  - **OI 4:84** – Operational procedures implemented throughout NAS at applicable NAS airports using appropriate advanced environmental procedures, with a particular focus on: Low noise approaches and operational procedures (such as runway selection and regional routes).
  - **OI 5:112** – RNP routes available to/from all runways at the top 100 airports. Assume RNP .15 is based on the need for closely spaced parallel runway operations; however FAA is requiring an RNP .3.
  - **OI 4:88** – Noise and emissions favorable RNP routes are used at the top 100 airports.
  - **OI 4:86, 5:89** - Further integration of latest technically-feasible, environmentally-enhanced technology into the fleet and operations.

- **Segment 7 (~2025)**
  - **OI 6:90, 7:91** - Comprehensive integration of latest technically-feasible, environmentally-enhanced technology into the fleet and operations.
Supporting Technology
Data Analysis and Modification

• Similar to procedures in use for several years for major airspace re-design projects.

• Use a 30-day sample of radar data for all CONUS OEP airports, and apply post-processing to each airport’s data:
  
  – Assign runways
  – Clip to 50nmi from the airport
  – Bundle the radar tracks
    • by arrival/departure fix
    • by day/night
    • using lateral geometry (algorithmic clustering)
    • by profile
  – Generate a backbone and dispersed sub-tracks for each bundle
    • Assign profile altitude controls as identified
Data Analysis and Modification (Cont’d)

- Modification addresses the behaviour of traffic under postulated future conditions. For the CDA case, we are currently concentrating on:
  - Lateral track shapes
  - Width of lateral dispersion
  - Vertical profile(s)
  - Categorization by aircraft type or other key characteristics

- Airspace Design Tool has many capabilities to support modifications, both algorithmically and graphically.
Example: ORD (KRENA) Arrivals to Runway 09R

3302 Tracks
Simple Bundling Example

1896 Tracks

313 Tracks

809 Tracks

283 Tracks
Backbone Generation

Note that spanning sub-tracks are NOT shown.

1896 Tracks

313 Tracks

809 Tracks

283 Tracks
Near-term CDA Modeling Approach
CDA Approach

- In the baseline scenario, radar-based altitude profiles will be identified and used in the baseline calculations for OEP airports.
- In future scenarios, CDA profiles will be simulated by using a “standard” 3-degree approach (no altitude controls specified), thereby allowing aircraft to make a gradual descent to the runway.
- We can also make a number of CDA profile families using different angles and altitudes to represent different aircraft or other key CDA characteristics.
CDA Approach (Cont’d)

- Key questions:
  - How many different CDA profiles?
  - How much lateral narrowing from today’s conditions?
  - Are there differences in the above when approaching the runway from the “opposite” side of the airport?
ORD (KRENA) Arrivals to Runway 09R – CDA Example
ORD (KRENA) Arrivals to Runway 09R – CDA Example

Standard profile 6,000 ft to ground as defined by INM/NIRS (3 degree descent).

10,000 ft to 6,000 ft profile defined by 2.5 degree descent.
ORD (KRENA) Arrivals to Runway 09R – CDA Example

- Generated backbone
- Simulated flight track following altitude controls
- Simulated flight track following standard profile (CDA)

Top of descent to standard profile as defined by NIRS.

Standard profile as defined by INM/NIRS.
Primary Arrivals
Routes to ORD 09R
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