Approved by the NextGen Advisory Committee October 2016

Joint Analysis Team:
Performance Assessment of North Texas Metroplex and Established on RNP in Denver

Report of the NextGen Advisory Committee in Response to Tasking from the FAA

October 2016
Joint Analysis Team: Performance Assessment of Metroplex and EoR

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Introduction/Background

The NextGen Advisory Committee (NAC) has been instrumental in helping the Federal Aviation Administration (FAA) move forward with NextGen implementation. In 2014, the Committee approved a recommendation for a set of integrated plans on four focus areas of NextGen capabilities (DataComm, Multiple Runway Operations, PBN, and Surface).

These plans were developed by a joint FAA-Industry team, the NextGen Integration Working Group (NIWG), operating under the NAC. The goal of the NIWG is to identify implementation priorities that deliver measurable benefits by certain dates, and, thereby, increase the community’s confidence in NextGen.

In June 2015, the NAC considered and approved six high level performance metrics intended to measure performance impacts attributable to the deployment of the four key NIWG capabilities outlined in the “NextGen Priorities Joint Implementation Plan” of October 2014. The set of metrics are intended for the FAA and industry to collaboratively monitor performance to understand the impact of implementations. The six metrics (detailed in Appendix B) are:

1. Actual Block Time
2. Actual Distance Flown
3. Estimated Fuel Burn
4. Throughput – Facility Reported Capacity Rates
5. Taxi-Out Time
6. Gate Departure Delay

Subsequently, the NAC formed the Joint Analysis Team (JAT) which includes operational and analytical experts from the FAA and industry. The JAT was formed to reach a common statement of fact regarding performance impacts and benefits that can be attributed to implementation of NextGen capabilities. To accomplish this goal, the JAT has analyzed data, metrics, methods and tools typically used by each of the parties in this type of assessment. This has included analyses of other measures deemed appropriate beyond the six metrics noted above. Additionally, the industry, through RTCA, selected PASSUR Aerospace to provide a database and associated analytical capability to track performance of these six metrics.

The JAT’s scope involves evaluation of the following capabilities at the following locations:

- Wake ReCat Implementations at Charlotte Douglass International Airport (CLT) and two Chicago area airports – O’Hare International Airport (ORD) and Chicago Midway International Airport (MDW)
- Performance Based Navigation (PBN) Metroplex Implementation in North Texas
- PBN Established on RNP (EoR) in Denver International Airport (DEN)

This report includes findings on North Texas Metroplex and Denver EoR implementations. Findings on Wake ReCat implementations were provided to the NAC in June 2016.
Methodology
The JAT is comprised of data and analysis experts from the FAA as well as the aviation industry, and the team conducted a series of meetings to discuss and review ongoing analysis. This team initially agreed by consensus on methodologies to evaluate the impacts of Metroplex and EoR. A subset of team members then utilized their own company data to assess Metroplex and EoR using these methodologies. Data from the FAA, MITRE, American Airlines and Southwest Airlines were utilized in this process. Team members utilized the agreed-upon methodology and different data sources to analyze the impacts and benefits of Metroplex and EoR. The JAT utilized these analysis results to document agreed upon findings that follow in this report.

The working dynamic between the FAA and industry team members remained a positive and professional one in which capable analysts from different perspectives challenged one another’s perspectives. The final product of this body is the result of strong collaboration and sharing of data and ideas between the FAA and industry. The JAT built trust and confidence amongst members throughout the process.

Summary of Findings

Established on RNP (EoR) in Denver

- EoR increased utilization of RNP AR approaches from 5.8% of arrivals to 6.6% of arrivals to Denver, an increase of 12%
  - Time saved from efficient approaches increased from 211 to 282 hours annually
- If an additional waiver is granted, EoR is expected to enable an increase up to 7.1% of arrivals executing RNP AR approaches.
  - Time saved expected to increase to 360 hours annually
- EoR is an important enabler to further future growth of utilization of efficient PBN approaches.

North Texas (NT) Metroplex

- Many external factors challenged pre vs. post Metroplex analysis
  - DFW/AAL re-banking, CRO, over-the-top elimination, Wright amendment at DAL, use of flow metering, change in wind patterns, and WN Cost Index change (speed increase)
- Changes in city pair block times driven by winds, not Metroplex
- The Team recognized the importance of system impacts of the Metroplex and, after analysis, determined to focus on flight trajectory changes within 300 nm as it best approximates effects of the North Texas Metroplex and allows for better isolating external factors pre/post implementation
- Metroplex has...
  - Segregated arrival routes between DFW and DAL
- Added route structure where flights previously vectored off-route
  - Enabler for increased TBFM forecasting accuracy, infrastructure for new tools and improved safety per SMEs
- Slightly increased flight distance within 300nm but slightly reduced time
- Clearly reduced level segments and increased continuous descents, particularly for DFW
Appendix A: Members of the Joint Analysis Team

Mike Cirillo, Airlines for America
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Christopher Oswald, Airports Council International
Timothy Campbell, American Airlines
Ilhan Ince, American Airlines
Balaji Nagarajan, American Airlines
Denise Neumann, American Airlines
Brian Will, American Airlines
Stephen Smothers, Cessna Aircraft Company
Colin Rice, City of Houston, Texas
Eugene Maina, DFW Airport
Steve Tobey, DFW Airport
Patrick Burns, Delta Air Lines
Thomas Carroll, Delta Air Lines
Steve Dickson, Delta Air Lines
Barrett Nichols, Delta Air Lines
Ken Speir, Delta Air Lines
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Paul Eckert, FAA
Pamela Gomez, FAA
Shane Hart, FAA
Leslie Higgins, FAA
Dave Knorr, FAA
Brian Kravitz, FAA
Lauren Lloyd, FAA
Dan Murphy, FAA
Lawrence Pugh, FAA

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LaVada Strickland, FAA
Dan Allen, FedEx Express
Bradley Ammer, FedEx Express
Matt Duty, FedEx Express
Kyle Smith, FedEx Express
Joe Bertapelle, JetBlue Airways
Ken Elliott, Jetcraft Avionics LLC
Lee Brown, Landrum-Brown
Mark McKelligan, NATCA
David Brukman, PASSUR Aerospace
Chris Maccarone, PASSUR Aerospace
Rob Golden, QED Consulting, LLC
Andy Cebula, RTCA, Inc.
Margaret Jenny, RTCA, Inc.
Trin Mitra, RTCA, Inc.
Bill Sperandio, Southwest Airlines
Tass Hudak, The MITRE Corporation
Bobby Kluttz, The MITRE Corporation
Pete Kuzminski, The MITRE Corporation
Debby Pool, The MITRE Corporation
Jeff Shepley, The MITRE Corporation
Marc Brodbeck, United Airlines, Inc.
Alex Burnett, United Airlines, Inc.
Glenn Morse, United Airlines, Inc.
Kevin Swiatek, United Parcel Service
## Appendix B: NAC Performance Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Reported Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Actual Block Time</td>
<td>Mean and std dev or 60% percentile</td>
<td>• Actual time from Gate-Out time to Gate-In time for a specified period of time by city pair</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• GA: IFR flight time from ramp taxi to ramp park</td>
</tr>
<tr>
<td>2. Actual Distance flown</td>
<td>Mean and std dev or 60% percentile</td>
<td>• Actual track distance between key city pairs for a specified period of time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• GA: IFR flight distance from take-off to TOC &amp; from TOD to touch down</td>
</tr>
<tr>
<td>3. Estimated Fuel burn</td>
<td>Mean and std dev</td>
<td>• Actual fuel burn for a specified period of time</td>
</tr>
<tr>
<td>4. Throughput – facility</td>
<td>Mean and peak capacity rates</td>
<td>• Facility Airport Arrival Rates (AAR) &amp; Arrival Departure Rate (ADR)</td>
</tr>
<tr>
<td>reported capacity rates*</td>
<td></td>
<td>• Airlines (recommend: <a href="http://www.fly.faa.gov/ois">http://www.fly.faa.gov/ois</a>) however, the working group is open</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to alternate measurements that meet the requirements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• GA: measured as access events – Radar vector and not SID as OUT event and Ground based nav</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and not GPS / WAAS-LPV as IN event</td>
</tr>
<tr>
<td>5. Taxi-out Time*</td>
<td>Mean and std dev or 60% percentile</td>
<td>• Actual time from Gate-Out to Wheels-Off time by airport (minutes/flight)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• GA: IFR flight taxi time from ramp taxi to take off</td>
</tr>
<tr>
<td>6. Gate Departure Delay</td>
<td>Delays/100 act depts. And total delay minutes</td>
<td>• Difference in actual Gate-Out time and scheduled Gate-Out time, Not measured for GA</td>
</tr>
</tbody>
</table>

* - Identified by FAA

1 GA data may not currently be collected