Welcome to the Meeting of the NextGen Advisory Committee

June 28, 2017
FedEx Corporation
Memphis, TN
Welcome & Introductions
PUBLIC MEETING ANNOUNCEMENT
Read by: Designated Federal Official Dan Elwell
NextGen Advisory Committee
June 28, 2017

In accordance with the Federal Advisory Committee Act, this Advisory Committee meeting is OPEN TO THE PUBLIC.

Notice of the meeting was Issued on June 13, 2017 and published in the Federal Register on:

June 15, 2017

Members of the public may address the committee with PRIOR APPROVAL of the Chairman. This should be arranged in advance.

Only appointed members of the Advisory Committee may vote on any matter brought to a vote by the Chairman.

The public may present written material to the Advisory Committee at any time.
NAC Meeting Agenda
June 28, 2017

- Opening of Meeting/Introduction of NAC Members
- Official Statement of Designated Federal Official
- Review and Approval Feb 2017 Meeting Summary
- Chairman’s Report
- FAA Report
- Northeast Corridor Phase One Tasking
- Enhanced Surveillance Task Group
- ADS-B Equipage
- NextGen Priorities Status-NIWG DataComm, MRO, PBN, Surface
- Joint Analysis Team
- Summary of Meeting/Closing Comments
- Adjourn
Review and Approval of:
February 22, 2017 – Meeting Summary
Chairman’s Report
David Bronczek, NAC Chair
Press and Social Media

**Instagram**

- Scott Peterssd
  - Now that I represent Point Loma I always watch to make sure the plane makes a nice wide turn. Well done. TRACON and @United. #CA52
  - _heykara_ Nice video! <3
  - bwalsh207. Waypoint LOWMAI
  - hcthetirst: 😻 😻
  - ruthannpeters: Pilot explained "no take offs before 6:30am. #pointlomaseepstilthens.

319 views
NOVEMBER 20, 2016
Add a comment...

**Facebook**

- Costa Mesa Mayor Pro Tem Sandy Genis
  - February 2
  - We were able to review expected changes in aircraft noise levels for specific addresses at the FAA workshop on the Southern California Metropolex, which would alter routing and procedures for aircraft at various airports in southern California.
  - Relieved to see that locations in Costa Mesa are expected to either remain unchanged or have a very slight reduction in overall aircraft noise. Average aircraft noise around both Harper and Kaiser Schools would drop by about 0.2 decibels. Unfortunately, it looks as if noise levels on the east side of Upper Newport Bay will increase.
  - More at the link below.

- NextGen – Community Involvement — Southern California
  - ) for the Southern California Metropolex project on August 31, 2016. This is the FAA’s final decision, and it enables the agency to move forward with implementing the project, which will replace dozens of existing conventional air traffic control procedures with new satellite-based procedures. The pr...
  - FAA.GOV

**Los Angeles Times**

- FAA invites the public to learn about upcoming airspace and air traffic control changes for the region

**Palm Desert Patch**

- FAA Holding Webinar on Flight Path Project Affecting Palm Springs Airport
  - And mark your calendars for Feb. 7 public forum on changes coming to Palm Springs and Ontario airports.
  - By Patch CA (Patch Staff) - Updated January 19, 2017 3:39 pm ET
FAA Report
Performance Based Navigation
Time, Speed, and Spacing Automation Tools

FAA Response to NAC Recommendations

June 28, 2017
Background

- **PBN NAS Navigation Strategy**
  - Collaborative FAA and Industry Effort
  - Key Strategic Commitments include “Shifting To Time- and Speed-Based Air Traffic Management”

- FAA asked the NAC to recommend automation tools needed to enable Navigation Strategy

- NAC provided recommendations in October 2016
  - Shift to Time-Based Management (TBM)
  - Continue deployment of enabling NextGen capabilities, Address Operations Culture, Training, and Integrate Aircraft Data with Ground Systems
NAC Recommendations

Goal: “Keep the aircraft on the PBN procedure from En Route to the runway while maintaining or increasing throughput”

• Near Term (2020)
  ✦ Policy, procedures and training to enable initial PBN capabilities and using existing tools and systems for a better integrated system
  ✦ Infusing time based metering into the culture

• Mid Term (2021-2025)
  ✦ Focuses on continued deployment of available NextGen capabilities consistent with meeting the goal of PBN TSS in an integrated manner
  ✦ Begins the process of integrating aircraft trajectory data with ground systems

• Far Term (2026-2030)
  ✦ Further enhances, increasing resilience of ground based tools
  ✦ Integrates the stand alone capabilities described in the mid-term
  ✦ Leverages FIM demonstration for potential full NAS implementation
  ✦ Based on experiences from Near and Mid-Term, begins implementing advanced Data Comm capabilities defined by SC-214 Standards for Air Traffic Data Communication Services
Summary of Response

1. Roadmap
   - Continue to move forward with capabilities
   - Evolution Planning

2. Change Management
   - Principles and Best Practices to Drive Change
   - Communications: Artifacts and Stakeholder Engagements
   - Taking Stock—2017 TBFM Use Survey

3. Vision
   - TBO=Time-Based Management + PBN
     - Applied on a Continuum; available NAS-wide with higher levels of performance applied when and where needed
   - Operational Scenarios
Roadmap

• Moving forward with the execution of these capabilities

• Initial Evolution Planning -- Setting New Implementation Approach
  ✤ Holistic and Efficient
  ✤ Data-Driven Decision Using Readiness Criteria
  ✤ “Right Tools for the Right Location at the Right Time”

• NAV Equipage Consistent with PBN NAS Navigation Strategy

<table>
<thead>
<tr>
<th>Terminal Sequencing and Spacing (TSAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near-Term (2020)</td>
</tr>
<tr>
<td>Recommendation</td>
</tr>
<tr>
<td>FAA Plans</td>
</tr>
<tr>
<td>Assessment</td>
</tr>
</tbody>
</table>

Table Excerpt from FAA Internal Document Summarizing a Comparative Analysis

Candidate Operating Areas

North East Corridor
North East Region
North Central Region
Mid-East Region
South Central Region
South East Region
South West Region

Recommendation (5) Implement TSAS at 9 sites, with initial IOC in 2019 and completion by 2022. (5) Deploy to remaining NSG1 Sites, and NSG2 Hub sites.

None

(5) Additional TSAS sites area candidate for TBFM WP4 (FID 2019)

N/A
Key PBN Equipage Needed

- Performance Based Navigation Strategy
  
  * By 2025, aircraft without the following performance requirements may not be able to efficiently access NSG 1 airports
    - RNAV (GPS) approach capability with vertical guidance;
    - RNP 1 capability;
    - DME navigation; and
    - RF capability
  
- Time of Arrival Control

- Identify next steps to achieve NSG1 airports

Change Management

**FAA Senior Leadership Buy-In**
- All Executives are pointing in this direction
- Air Traffic Services added as a NAC SC member to engage at highest levels

**Air Traffic Commitment**
- Air Traffic Services is committed to moving to time based management
- Engaging messaging to the workforce
- Focus operations on the use of time-based management and towards an end state operational vision

**Field Support**
- Adapt to how these tools change the way we need to work
- Resourcing our facilities effectively to operate differently.
- Changing the functions Traffic Management performs to take advantage of technology
- Developing site support and training to support a common understanding of the new automation tools

**Collaborate and Identify Industry Culture Changes Needed**
- Engage industry on pilot controller interactions and operator culture changes
Vision

• Moving to a TBO world ➔ TBM + PBN
  ‘TBO is an ATM Concept for the NAS that enables airspace users and the ANSP to strategically manage and optimize trajectories throughout the operation based on the aircraft’s ability to fly precise paths in time / space, and the increased ability to exchange trajectories’

• Vision Paper Undergoing Agency-Wide Review
  Driving Toward Developing Community Vision
Vision – Enablers

Equipage and Data Provisions

• Data Communication
  ✦ FANS
  ✦ ATNB2

• ADS-B In

• Data Provision and Collaboration
  ✦ 11 Data Elements
  ✦ Submission of User Preferences and Priorities
Summary

• Deploy Automation Tools for Time, Speed and Spacing in Geographical Operating Areas

• Institutionalize Change Management Practices to Maximize PBN

• Execute to the PBN NAS NAV Strategy

• Collaborate with Industry on TSS Deployment Strategy

• Engage Industry to Achieve Community Vision
Northeast Corridor Phase One Update
Engaging the Aviation Community

NAC Discussion Feb 2017
• Follow-up communications from NAC members

NACSCC March-June 2017
• 8 meetings of the Task Group involving over 50 organizations
• Development of Goals/Metrics, Assumptions/Guiding Principles
• Review – Industry and FAA NEC initiatives
• Identification of capabilities and associated roll up to Objectives
• Ranking Capability Objectives – Quantitative & Qualitative
  • 28 organizations responded to survey to rank NEC capability options; respondents included operators, labor, automation providers, OEMs, airports

Phase Two – New NEC NextGen Integration Working Group – October 2017
• Implementation Plans – FAA-Industry
Near-Term Goals/Metrics for NEC

NEC Near-Term Goal

- Improve execution of today’s operation
  - Operate full operation
  - Operate on time
  - Operate predictably

Associated Metrics

- Completion Factor
- Delay versus Schedule
- Block Times
- Throughput

Overarching:

- Adverse weather is a major issue in accomplishing goals in the NEC
- FAA Northeast corridor staffing key to success; daily operations and implementing new capabilities
## Capability Options Considered for NEC

<table>
<thead>
<tr>
<th>Capability Objectives</th>
<th>Description</th>
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<tbody>
<tr>
<td>Deconflict Airports</td>
<td>• Reduce or remove dependencies between New York airports that constrains airport throughput today</td>
</tr>
</tbody>
</table>
| Improve Individual Airport Throughput                      | • Improve throughput to/from NEC airports and terminal airspace sectors  
• May impact separation standards, rules, etc.                                                                                                        |
| Improve and Integrate Existing Flow Management Capabilities | • Improve use and adaptation of existing tools  
• Enhance collaborative planning process and tools  
• Integrate application of existing capabilities across system                                                                                       |
| Improve Airspace Throughput                                | • Improve throughput through NEC airspace and en route airspace sectors  
• May impact separation standards, rules, etc.                                                                                                         |
| Implement New Flow Management Decision Support Tools        | • Implement new tools to assist in future time-based flow management                                                                                                                                 |
| Improve NAS Information, Common SA                         | • Enhanced information to aid in planning or decision making                                                                                                                                               |
| Create New Noise Abatement Procedures                      | • Implement and operate new noise abatement procedures that maximize aircraft participation and, where feasible, reduce impact to local communities   |
## Results of Survey to Prioritize Capability Options

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<th>Percent 1, 2 or 3</th>
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<td>4.5</td>
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</tr>
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<td>Implement New Flow Management Decision Support Tools</td>
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</tr>
<tr>
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<td>27%</td>
</tr>
<tr>
<td>Create New Noise Abatement Procedures</td>
<td>2.0</td>
<td>15%</td>
</tr>
</tbody>
</table>
Implementation Hurdles

- Collaborative engagement between all ATC operational lines of business & operators
- Collective ability or willingness to (de)prioritize specific projects or initiatives
- Collective ability to adjust existing plans and schedules
- Controller and Operator staffing
- Cultural issues – i.e. controller, pilots, dispatcher acceptance & implementation
- Environmental issues and concerns
- Funding
- Mixed equipage/ PBN equipage of aircraft/differing capabilities, ability to leverage available equipage
- Pre-operational planning and agile flexibility in consideration of unforeseen constraints that require real time adjustments to the plan
- Training
Looking Ahead to Phase Two

June – October: Develop project/program level implementations that improve execution of today’s operation

• Prioritize with increased emphasis on airport deconfliction & improving airport throughput, particularly during degraded weather conditions

• Leverage implementation readiness
DISCUSSION

and

Consideration for approval of Final Report
Backup
## Participants in Phase One

<table>
<thead>
<tr>
<th>Aerospace Industries Association (AIA)</th>
<th>Garmin Ltd.</th>
<th>Port Authority of New York &amp; New Jersey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Line Pilots Association (ALPA)</td>
<td>General Aviation Manufacturers Association</td>
<td>Professional Aviation Safety Specialists</td>
</tr>
<tr>
<td>Airbus</td>
<td>Harris Corporation</td>
<td>Project Management Enterprises Inc.</td>
</tr>
<tr>
<td>Aircraft Owners and Pilots Association</td>
<td>Honeywell International, Inc.</td>
<td>Raytheon</td>
</tr>
<tr>
<td>Aireon, LLC</td>
<td>International Air Transport Association</td>
<td>Regional Airline Association</td>
</tr>
<tr>
<td>Airline Dispatchers Federation</td>
<td>Jeppesen</td>
<td>Rockwell Collins, Inc.</td>
</tr>
<tr>
<td>Airlines for America</td>
<td>JetBlue Airways</td>
<td>RTCA, Inc.</td>
</tr>
<tr>
<td>Airports Council International (ACI North America)</td>
<td>Jetcraft Avionics LLC</td>
<td>Saab Sensis Corporation</td>
</tr>
<tr>
<td>Alaska Airlines</td>
<td>L-3 Communications</td>
<td>Sandel Avionics, Inc.</td>
</tr>
<tr>
<td>American Airlines, Inc.</td>
<td>Leidos</td>
<td>Sensurion Aerospace</td>
</tr>
<tr>
<td>Atlas Air</td>
<td>LeighFisher</td>
<td>SESAR Joint Undertaking</td>
</tr>
<tr>
<td>Cessna Aircraft Company</td>
<td>Metron Aviation, Inc.</td>
<td>Southwest Airlines</td>
</tr>
<tr>
<td>City of Houston, Texas</td>
<td>Mosaic ATM, Inc.</td>
<td>Thales Group</td>
</tr>
<tr>
<td>Dallas/Fort Worth International Airport</td>
<td>National Air Traffic Controllers Association</td>
<td>The Boeing Company</td>
</tr>
<tr>
<td>Delta Air Lines, Inc.</td>
<td>National Association of State Aviation Officials</td>
<td>The MITRE Corporation</td>
</tr>
<tr>
<td>DoD Policy Board on Federal Aviation</td>
<td>National Business Aviation Association</td>
<td>U.S. Air Force</td>
</tr>
<tr>
<td>Elbit Systems</td>
<td>NAV CANADA</td>
<td>United Airlines, Inc.</td>
</tr>
<tr>
<td>EUROCONTROL</td>
<td>NOISE (The National Association to Insure a Sound Controlled Environment)</td>
<td>United Parcel Service (UPS)</td>
</tr>
<tr>
<td>FedEx Express</td>
<td>Northrop Grumman Corporation</td>
<td></td>
</tr>
<tr>
<td>Capability Objectives</td>
<td>Description</td>
<td>Sample Related Projects &amp; Programs</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Deconflict Airports                      | • Reduce or remove dependencies between New York airports that constrain airport throughput today | Specific ideas include: • Increase use of enhanced PBN procedures and/or GLS  
• Deconflict LGA ILS-13 from EWR & TEB  
• EWR 04R missed app right turn to deconflict TEB dep’s  
• LGA, JFK operations – LGA 31 PBN |
| Improve Individual Airport Throughput     | • Improve throughput to/from NEC airports and terminal airspace sectors  
• May impact separation standards, rules, etc. | Specific ideas include:  
• Term Airspace Resectorization  
• 3 LGA RNAV Departures/ELSO  
• 7110.30B: BOS, EWR, PHL  
• Capping and tunneling  

| Improve and Integrate Existing Flow Management Capabilities | • Improve use and adaptation of existing tools  
• Enhance collaborative planning process and tools  
• Integrate application of existing capabilities across system | Specific ideas include:  
• TFMS  
• Use of TBFM/RAPD/IDRP  
• Departure Pre-Scheduling  
• Utilize CTOP  

| Improve Airspace Throughput               | • Improve throughput through NEC airspace and en route airspace sectors  
• May impact separation standards, rules, etc. | Specific ideas include:  
• ER Airspace Resectorization  
• ZNY Offshore Resectorization and PBN SIDs & STARs  
• Atlantic Coast Route Program (ACRP)  

| Implement New Flow Management Decision Support Tools | • Implement new tools to assist in future time-based flow management | Specific ideas include:  
• Surface/TFDM  
• Implement TSAS  
• FMS RTA/StopLine metering  

| Improve NAS Information, Common SA        | • Enhanced information to aid in planning or decision making | Specific ideas include:  
• On Demand NAS info  
• National Operational Dashboard  
• New modeling/analysis capabilities  

| Create New Noise Abatement Procedures     | • Implement and operate new noise abatement procedures that maximize aircraft participation and, where feasible, reduce impact to local communities | Specific ideas include:  
• ROBER OPD to JFK  
• Nighttime GLDMN  
• Off-peak noise efficient nighttime alt  
• DCA South SIDs  
• PBN O/V app to LGA 22  
• Offset app to EWR 22L  


Prioritizing NextGen Capabilities

Utilized NAC NextGen prioritization criteria:

- Benefits (monetizable) – 46%
- Benefits (non-monetizable) – 13%
- Implementation Readiness – 28%
- Other Considerations – 13%
Who responded to the survey

<table>
<thead>
<tr>
<th>Type of Respondent</th>
<th>Count of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator (Airlines, A4A, NBAA, AOPA, etc.)</td>
<td>11</td>
</tr>
<tr>
<td>OEM (Aircraft, Avionics)</td>
<td>7</td>
</tr>
<tr>
<td>ATC Automation &amp; Infrastructure</td>
<td>5</td>
</tr>
<tr>
<td>Labor (NATCA, ALPA, etc.)</td>
<td>3</td>
</tr>
<tr>
<td>Airport</td>
<td>2</td>
</tr>
<tr>
<td>Grand Total</td>
<td>28</td>
</tr>
</tbody>
</table>
### Detail - Overall

#### Average Rank (7 = High, 1 = Low)

<table>
<thead>
<tr>
<th>Capability Categories</th>
<th>Wgtd Avg</th>
<th>Operating 4 Full Operation &amp; Improving Completion Factor</th>
<th>Operating On Time &amp; Improving Delay Metrics</th>
<th>Operating Predictably &amp; Improving Throughput/Blk &amp; Time</th>
<th>13% Non-Monetizable Benefits (Noise, Access, Security, Privacy)</th>
<th>13% Other Considerations (NG Infrastructure, Confidence, Global Harm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deconflict Airports</td>
<td>5.2</td>
<td>5.4</td>
<td>5.1</td>
<td>5.2</td>
<td>5.7</td>
<td>4.8</td>
</tr>
<tr>
<td>Create New Noise Abatement Procedures</td>
<td>2.0</td>
<td>1.4</td>
<td>1.4</td>
<td>1.3</td>
<td>4.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Improve NAS Information, Common SA</td>
<td>3.5</td>
<td>3.1</td>
<td>3.3</td>
<td>3.5</td>
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<td>4.0</td>
</tr>
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<td>4.5</td>
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<td>4.4</td>
<td>3.7</td>
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<tr>
<td>Implement New Flow Management Decision</td>
<td>3.9</td>
<td>3.9</td>
<td>4.1</td>
<td>3.9</td>
<td>3.1</td>
<td>4.4</td>
</tr>
<tr>
<td>Improve Individual Airport Throughput</td>
<td>4.8</td>
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<td>4.9</td>
<td>5.1</td>
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<td>4.2</td>
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#### Percent Ranked 1st/2nd/3rd

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<td>79%</td>
<td>68%</td>
<td>75%</td>
<td>86%</td>
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</tr>
<tr>
<td>Create New Noise Abatement Procedures</td>
<td>15%</td>
<td>4%</td>
<td>4%</td>
<td>4%</td>
<td>54%</td>
<td>18%</td>
</tr>
<tr>
<td>Improve NAS Information, Common SA</td>
<td>27%</td>
<td>21%</td>
<td>25%</td>
<td>25%</td>
<td>29%</td>
<td>36%</td>
</tr>
<tr>
<td>Improve and Integrate Existing Flow Management</td>
<td>42%</td>
<td>39%</td>
<td>54%</td>
<td>43%</td>
<td>21%</td>
<td>54%</td>
</tr>
<tr>
<td>Implement New Flow Management Decision</td>
<td>38%</td>
<td>32%</td>
<td>43%</td>
<td>38%</td>
<td>25%</td>
<td>54%</td>
</tr>
<tr>
<td>Improve Individual Airport Throughput</td>
<td>58%</td>
<td>68%</td>
<td>64%</td>
<td>63%</td>
<td>50%</td>
<td>43%</td>
</tr>
<tr>
<td>Improve Airspace Throughput</td>
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#### Results in Priority Order

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#### Capability Priority for Northeast Corridor

![Graph showing capability priority for Northeast Corridor](image-url)
BREAK
Enhanced Surveillance Task Group
Draft Final Report

Co-Chairs:
Steve Brown, NBAA
Bart Roberts, JetBlue
FAA Controlled Oceanic Airspace
Unique Characteristics

- Large volume of airspace
- Communications is an important limiting factor
  - No “push to talk”
  - Cannot directly intervene in a timely manner
- Airspace is not managed in the same tactical manner as domestic airspace
- “Timing” as a separation basis is an important safety mechanism
Summary of Benefits

- Reduced Separation Minima - oceanic separation standards
- Optimized operating profiles
- Enhanced Safety
- Enhanced Search and Rescue
- Reduced green-house gas emissions/Fuel savings
- More optimal design of airspace
- Enhanced Air Traffic Flow Management
- Increased surveillance system augmentation
- Harmonized surveillance requirements/equipage
Summary of Recommendations

- FAA should proceed with enhanced surveillance capability in Oceanic airspace
- Space-based ADS-B technology recommended capability
- Operators have specific equipage requirements to participate
- Based on data and information available to ESTG, FAA should (as an ANSP) bear the costs as it does domestically.
  - The ESTG does not currently have sufficient information to conduct a valid analysis about the prioritization of this investment in comparison to other investments, and recommend that this would be done at the NAC level.
- Implementation should be done by regions
- WATRS airspace region holds most potential for increased benefit
- NACSC continue engaging s FAA develops business case analysis
Enhanced Task Group
Members & SME Organizations

- ALPA
- Airbus
- Aireon, LLC
- Airlines for America
- Alaska Airlines
- American Airlines
- DFW
- Delta Air Lines
- FAA (SMEs)
- FedEx Express
- GAMA
- Harris Corporation
- Honeywell
- INMARSAT
- IATA
- Iridium Satellite LLC
- JetBlue Airways
- L-3 Communications
- Leidos
- NATCA
- NBAA
- NAV CANADA
- Northrop Grumman
- Rockwell Collins
- RTCA, Inc.
- Sensurion Aerospace
- SESAR
- Thales Group
- The Boeing Company
- MITRE
- United Airlines
- UPS
Back-up
Tasking: Request from the FAA

- Evaluate the need and benefit of enhanced surveillance capabilities
- Examine the potential benefits to operators of reduced oceanic separation minima using space-based ADS-B or other improvements to surveillance
- Potential funding mechanisms that might be possible and at what cost
- Evaluate the business case for enhanced surveillance in US-controlled airspace
Benefits

- Reduced Separation Minima - oceanic separation standards

- Optimized operating profiles
  - User Preferred Routings (UPRs)
  - Efficient flight levels and increased opportunity to step climb
  - Variable Mach

- Enhanced Safety
  - Enhanced Aircraft Tracking
  - Enhanced Situational awareness
  - Improved weather avoidance
  - Enhanced safety alerting
  - Improved cross-flight information boundary error detection
  - Improved and earlier detection of off-track errors
  - Enhanced height monitoring in RVSM airspace
Benefits (cont.)

- Enhanced Search and Rescue
- Reduction in green-house gas emissions/Fuel savings
- More optimal design of airspace
- Enhanced Air Traffic Flow Management
- Increased surveillance system augmentation and significant decrease of surveillance gaps
- Harmonize surveillance requirements/equipage for increasing interoperability for operators
Recommendations (More Detail)

- FAA should proceed with the introduction of enhanced surveillance capability in Oceanic airspace.

- Space-based ADS-B technology, when coupled with Future Air Navigation System (FANS, controller-Pilot data link (CPDLC), Automatic Dependent Surveillance – Contract (ADS-C), and required Navigation Performance Level 4 (RNP4) capabilities appears to be closer to providing a reduced separation of 15/15 than ADS-C when coupled with CPDLC and RNP4.

- Based on data and information available to ESTG, FAA should (as an ANSP) bear the cost for enhanced surveillance costs as it does domestically.
  - The ESTG does not currently have sufficient information to conduct a valid analysis about the prioritization of this investment in comparison to other investments, and recommend that this would be done at the NAC level.

- Aircraft operators that are equipped with ADS-B, Future Air Navigation System (FANS) Controller Pilot Data Link Communications (CPDLC), Automatic Dependent Surveillance-Contract (ADS-C), and Required Navigation Performance Level 4 (RNP 4) capabilities will receive full benefits of enhanced surveillance in FAA controlled oceanic airspace.

- Implementation of enhanced surveillance should be done by regions.

- The WATRS airspace region holds the most potential for increased benefit.

- The ESTG recommends the FAA engages and provides interim reports to the NACSC on the development of the business case analysis.
<table>
<thead>
<tr>
<th>Lateral Standard</th>
<th>Aircraft Requirements</th>
<th>RSP</th>
<th>Communication</th>
<th>RCP</th>
<th>RNP</th>
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</thead>
<tbody>
<tr>
<td>50 NM</td>
<td>Significant waypoint</td>
<td>400</td>
<td>HF Voice to third party radio operator</td>
<td>400</td>
<td>10</td>
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<tr>
<td>30 NM*</td>
<td>ADS-C</td>
<td>180</td>
<td>VHF Voice or CPDLC</td>
<td>240</td>
<td>4</td>
</tr>
<tr>
<td>23 NM</td>
<td>ADS-C</td>
<td>180</td>
<td>VHF Voice or CPDLC</td>
<td>240</td>
<td>4</td>
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<tr>
<td></td>
<td>ADS-C - TBD</td>
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<td>TBD</td>
<td>TBD</td>
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<table>
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<th>Longitudinal</th>
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<th>RSP</th>
<th>Communication</th>
<th>RCP</th>
<th>RNP</th>
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<tbody>
<tr>
<td>10 minutes</td>
<td>Significant waypoint</td>
<td>400</td>
<td>HF Voice to third party radio operator</td>
<td>400</td>
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<tr>
<td>50 NM (w/ ADS-C)</td>
<td>ADS-C periodic</td>
<td>180</td>
<td>VHF Voice or CPDLC</td>
<td>240</td>
<td>10</td>
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<tr>
<td></td>
<td>- RNP 10: 27 minutes</td>
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</tr>
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<td></td>
<td>- RNP 4: 32 minutes</td>
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<td>50 NM (w/out ADS-C)</td>
<td>Position report every 24 minutes</td>
<td>180</td>
<td>VHF Voice or CPDLC</td>
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<tr>
<td>5 minutes</td>
<td>ADS-C periodic</td>
<td>180</td>
<td>VHF Voice or CPDLC</td>
<td>240</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>- 14 minutes</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>30 NM</td>
<td>ADS-C periodic</td>
<td>180</td>
<td>VHF Voice or CPDLC</td>
<td>240</td>
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<tr>
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<td>- ZOA: 12 minutes</td>
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<td>- ZNY: 10 minutes</td>
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<td>- ZAN: 10 minutes</td>
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<td>ADS-C - TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

**Purple** – Approved by ICAO but not implemented in FAA-controlled oceanic airspace

**Blue** – Current standards implemented in U.S. oceanic airspace

**Red** – Proposed standards in ASEPS concept.

* There are no RSP or RCP requirements for this standard; listed RSP/RCP are recommendations only.
DISCUSSION and Consideration for approval of Final Report
US Air Carrier Operator Installation Plans and Observed Installs

Updated plans from:
- Compass
- Delta
- Envoy
- ExpressJet
- FedEx
- GoJet
- Horizon
- JetBlue
- Piedmont
- SkyWest
- Southwest
- Trans States
- United
- UPS

Operator plan data current as of 06/15/2017
Fleet sizes based on 2017 APO Aerospace Forecast
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Compliance data current as of 06/01/2017
Aircraft Expected to Equip for ADS-B

Grouped by Operation Type

- 80K (>5 days)
- 127K (>1 day)
- 162K total

Averaging 1700 new aircraft / month

*VFR aircraft based at Class B or C airport, or flew through ADS-B rule airspace
Back-up
Equip 2020
ADS-B Equipage & Avionics Performance Update

June 1, 2017
## June 2017 Equipage (good install) Monitoring

Rule Driven ADS-B Out Aircraft Detected by FAA network

<table>
<thead>
<tr>
<th>Category</th>
<th>As of 1-May 2017 (ATAT)</th>
<th>As of 1-June 2017 (ATAT)</th>
<th>Monthly Increase</th>
<th>% of estimated fleet equipped^, as of 1-June-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Link Version 2</td>
<td>29,000</td>
<td>30,658</td>
<td>1,658</td>
<td>5.72%</td>
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<tr>
<td>1090ES</td>
<td>22,904</td>
<td>24,566</td>
<td>1,662</td>
<td>7.26%</td>
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<tr>
<td>UAT</td>
<td>5,236</td>
<td>5,314</td>
<td>78</td>
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<tr>
<td>Dual</td>
<td>860</td>
<td>798</td>
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<td>US General Aviation (includes</td>
<td>24,173</td>
<td>25,549</td>
<td>1,376</td>
<td>5.69%</td>
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<tr>
<td>EXP &amp; LSA)</td>
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<td>16.0% - 25.5%</td>
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<tr>
<td>US Air Carrier</td>
<td>1,046</td>
<td>1,083</td>
<td>37</td>
<td>3.54%</td>
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<tr>
<td>Intl General Aviation*</td>
<td>1,831</td>
<td>1,885</td>
<td>54</td>
<td>2.95%</td>
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<tr>
<td>Intl Air Carrier</td>
<td>656</td>
<td>694</td>
<td>38</td>
<td>5.79%</td>
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<tr>
<td>U.S. Military &amp; US. Special Use</td>
<td>29</td>
<td>27</td>
<td>-2</td>
<td>-6.90%</td>
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</tbody>
</table>

*Aircraft incorrectly reporting outside US ICAO block are included in Intl GA count.

^percentage range based on estimates of 5,000-6,000 US air carrier aircraft and 100K-160K US general aviation aircraft

ATAT – ATAT is used to generate these numbers starting on June 1, 2016
ADS-B Out Version 2 Equipage U.S. General Aviation (good installs) (including Exp & LSA aircraft)
Actuals vs 100K and 160K by 2020 Goals

Note: Starting Feb 2016 GA aircraft tracking changed from all ADS-B equipped aircraft to only those aircraft with good ADS-B installs.
ADS-B Out Version 2 Equipage (good installs) U.S. Air Carriers
Actuals vs 5K and 6K by 2020 Goals

<table>
<thead>
<tr>
<th>Date</th>
<th>5K by 2020 Goal</th>
<th>6K by 2020 Goal</th>
<th>Actual U.S. Air Carrier</th>
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<td></td>
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<tr>
<td>1/1/2013</td>
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<tr>
<td>1/1/2014</td>
<td></td>
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<tr>
<td>1/1/2015</td>
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<tr>
<td>1/1/2016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1/2017</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1/2018</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1/1/2019</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1/2020</td>
<td></td>
<td></td>
<td>1,083</td>
</tr>
</tbody>
</table>

Federal Aviation Administration
US Air Carrier Equipage & Avionics Performance

Number of Aircraft

- Equipped
- Good Installs
- NPE Aircraft
- Operational Error*

* Flight ID Issues

1-Jan-17: 851, 9
1-Feb-17: 887, 9
1-Mar-17: 946, 12
31-Mar-17: 999, 12
1-May-17: 1,074, 28
1-Jun-17: 1,118, 35

Federal Aviation Administration
Equipage Status - U.S. Air Carrier June 1, 2017

Number of ADS-B Version 2 Aircraft

<table>
<thead>
<tr>
<th>Carrier</th>
<th>Number</th>
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</thead>
<tbody>
<tr>
<td>UPS</td>
<td>221</td>
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<tr>
<td>UAL</td>
<td>212</td>
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<tr>
<td>DAL</td>
<td>141</td>
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<tr>
<td>SKW</td>
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<td>ASA</td>
<td>34</td>
</tr>
<tr>
<td>CPZ</td>
<td>20</td>
</tr>
</tbody>
</table>
Federal Aviation Administration

International GA Equipage & Avionics Performance

Number of Aircraft

1-Jan-17 1-Feb-17 1-Mar-17 31-Mar-17 1-May-17 1-Jun-17

Equipped

Good Installs

NPE Aircraft
International Air Carrier Aircraft Equipage and Avionics Performance

Number of Aircraft

1-Jan-17 | 1-Feb-17 | 1-Mar-17 | 31-Mar-17 | 1-May-17 | 1-Jun-17
---|---|---|---|---|---
33 | 25 | 27 | 22 | 22 | 24

Equipped
Good Installs
NPE Aircraft
US Aircraft with SIL = 0

- All USA
- GA
- Exp & LSA
- Air Carrier (Zero)
- Rotorcraft

Number of Aircraft
US Fixed-Wing Single-Engine (Rebate) Aircraft Equipage & Performance

* These aircraft would not have met criteria for rebate
UAS ADS-B Equipage Plans
Key Observations:

- **Miniaturized ADS-B out Supply**
  - Suppliers expected to meet demand curve as shown in chart
  - Hold as Watch Item: Industry Scalability – All manufacturers are small businesses
- **TSO requirements for miniature ADS-B out units must be amended to support UAS**
  - Requirements include specifications for human-machine interface
- **Infrastructure growth required to support increase in ADS-B usage**
  - Production of UAS requiring ADS-B out expected to reach parity with production of manned aircraft
  - UAS manufacturers must support burden of infrastructure growth and development of rules
UAS in the NAS – Which UAS need ADS-B?

Small UAS < 55 lbs:
- Examples: hand launch UAS and small multicopters
- Most small UAS fit within the bounds of FAR Part 107 (i.e. ADS-B not required)
- Exception: BVLOS operations, e.g. Package Delivery, Agriculture, Critical Linear Infrastructure

Small UAS > 55 lbs:
- Examples: Integrator (RQ-21), Shadow, Aerosonde
- Civil and Commercial markets
- Outside of Part 107 rules (above 55 lbs)
- ADS-B out required for operations near airports

Focus market size study here:
- Outside of Part 107
- Too small for manned A/C ADS-B units

Large UAS (1,000 lbs +):
- Examples: Predator, Global Hawk
- Large UAS can use Manned aircraft ADS-B units
Focus market size study here:

- Outside of Part 107
- Too small for Manned aircraft ADS-B out
- These UAS will require an airworthiness certification
- Airworthiness Certification will be inflection point in growth of UAS market in CONUS

Manufacturers likely seeking airworthiness certification in these categories include:

- Yamaha
- Google
- Aerovironment
- Insitu
- Amazon
- Textron / Aerosonde
- Arcturus
Market Size Assumptions:

- Assume small UAS > 55 lbs **Commercial Market** will be similar to 2004 UAS **Defense Market**
- Assume Package Delivery will be in test and evaluation phase
- Assume Ag sprayer growth similar to commercial market for small UAS > 55 lbs

**Small UAS Requiring ADS-B Market Size Estimate:**

- Yamaha: 20 aircraft
- Google: 100 aircraft
- Aerovironment: 20 aircraft
- Insitu: 20 aircraft
- Amazon: 100 aircraft
- Textron / Aerosonde: 20 aircraft
- Arcturus: 20 aircraft

- Total ≈ 300 SUAS with ADS-B out **requirement** in 2020
Small UAS Requiring ADS-B – 2025 Projection:

- Yamaha: 200 aircraft
- Google: 1,000 aircraft
- Aerovironment: 200 aircraft
- Insitu: 200 aircraft
- Amazon: 1,000 aircraft
- Textron / Aerosonde: 200 aircraft
- Arcturus: 200 aircraft
- Total ≈ 3,000 SUAS with ADS-B out requirement in 2025

Beyond 2020 outlook:

- TSO requirements for miniature ADS-B out units must be amended to support UAS
- Miniature ADS-B availability likely will scale to meet demand
- Demand will be higher if ADS-B is part of solution for UAS detect and avoid
- ADS-B supply can grow; commensurate infrastructure growth required
Manufacturers developing small ADS-B Transponders (Mode S with ADS-B Out):
• uAvionics
• Sagetech
• Peckham Technology
• May have major player enter at larger production rates if demand exists

Production Outlook:
• Production capacity expected to exceed hundreds per month
• TSO Requirements for miniature ADS-B out units must be amended to support UAS
  • Requirements include specifications for human-machine interface
• Watch Item: Production capacity in 2025
  • All manufacturers are small businesses
Summary

Key Observations:

- **Miniaturized ADS-B out Supply**
  - Suppliers expected to meet demand curve as shown in chart
  - Hold as Watch Item: Industry Scalability – All manufacturers are small businesses
- **TSO requirements for miniature ADS-B out units must be amended to support UAS**
  - Requirements include specifications for human-machine interface
- **Infrastructure growth required to support increase in ADS-B usage**
  - Production of UAS requiring ADS-B out expected to reach parity with production of manned aircraft
  - UAS manufacturers must support burden of infrastructure growth and development of rules

![Miniaturized ADS-B Demand](chart)

- Production estimates of new manned aircraft based on historic trends of aircraft registrations
- 2020 Equipage Goal for Manned A/C: ~160k A/C
Thank You
Backup
Two reasons for ADS-B on Small UAS:

1. **See / Detect and Avoid**
   - ADS-B in/out likely will not meet requirements of FAR 91.113
   - Ground-based radar may be intermediate solution

2. **2020 ADS-B Mandate:**
   - Class A, B, and C airspace.
   - Class E airspace within the 48 contiguous states and the District of Columbia at and above 10,000 feet MSL, excluding the airspace at and below 2,500 feet above the surface.
   - Class E airspace at and above 3,000 feet MSL over the Gulf of Mexico from the coastline of the United States out to 12 nautical miles.
   - Around those airports identified in 14 CFR part 91, Appendix D.
Small Unmanned Aircraft Regulations, FAR Part 107, issued June 2016

Highlights:
- Applies to drones < 55 lbs
- VLOS only
- Flights during daylight or twilight
- 3 miles minimum weather visibility
- 400 ft AGL max altitude
- 87 kts max speed
- Flights over people not allowed (except for flight participants)
- Package delivery / external load allowed if aircraft + package < 55 pounds
- Remote pilot airman certificate required
Most small UAS < 55 lbs are covered by Part 107
• Exception: BVLOS operations, e.g. Package Delivery, Agriculture, Critical Linear Infrastructure

Insurance
Emergency Management
Agriculture
Construction, Industrial, and Utility Inspection
Real Estate
Aerial Photography

FAA Aerospace Forecast
Operations in the NAS (outside of Part 107) require an Airworthiness Certificate

- **UAS certifications likely to use FAR Part 21.17b for near-term type certs**
  - Long-term: Drone Advisory Committee to develop new certification requirements
- **FAR Part 21.17b is a process for certification authorities to establish appropriate criteria**
  - Can accommodate any particular type design immediately, often leveraging relevant portions of existing standards
- **Part 21.17b does not prescribe UAS solution for see and avoid (FAR 91.113)**

Airworthiness Certification will be inflection point in growth of UAS market in CONUS
Projection of small UAS production for commercial market based on historical trends
Emergent UAS Commercial Market in 2020 (> 55 lbs) – likely will be similar to –
Emergent UAS Defense Market circa 2004
Market Size Assumptions for small UAS < 55 lbs:

• Package delivery UAS is primary ADS-B market driver for small UAS < 55 lbs
• Package delivery still in development
• Airworthiness certification not complete
• 2020 timeframe may see transition from development phase to test and evaluation phase
• Aircraft required for test and evaluation phase ≈ 100 aircraft
DISCUSSION
LUNCH
NextGen Integration Working Group
Priorities and Reporting Status
Data Comm

Industry Leads:
Chuck Stewart, United Airlines
John O’Sullivan, Harris Corporation

FAA SME:
Jesse Wijntjes, FAA
Juan Narvid, FAA
The Pegasus 1 Flight Management System (FMS) contains latent issues that impact flight operations.

Impact to the Data Comm Program
- 771 US registered B757 & B767 aircraft with Pegasus 1 installed will not be able to receive re-routes in en route airspace.

Current Status
- FAA/Industry through the Data Comm Implementation Team (DCIT) developed a temporary ground mitigation that is not viable for the long term.

Way Forward
- Latent avionics issues present a risk to Data Comm service requirements.
- Address latent avionics issues to support DataComm operations in EnRoute airspace.
DISCUSSION
Back-up
Data Comm – Update

✓ Tower Services Waterfall – Q4 2016
  - Completed challenge waterfall in December 2016 – 2½ years ahead of plan
  - Additional towers (RSW, CMH, CHS, BUF, RNO, ADW, and VNY) scheduled to all be operational with data Comm services by June 2018

✓ Implementation Framework for non-VDL Mode 2 Media – Q1 2017
  - Moving forward with agreed to framework

• Initial Operating Capability (IOC) for Initial En Route Services at first Air Route Traffic Control Center (ARTCC) – Q3 2019
  - Started development, integration and test of Data Comm Initial En Route Services
  - Conducting early operational evaluations and flight deck demos with stakeholders
  - Working risk mitigation strategies to address challenges in ERAM and legacy avionics

• Airlines to equip 1,900 aircraft – Q4 2019
  - 3,053 Data Comm equipped aircraft as of June 10, 2017 (includes FANS/VDL Mode 2, FANS/VDL Mode 0, business jets, and international aircraft – total count is 3,827 if DoD aircraft are included)
  - 1,359 aircraft have been equipped through the equipage initiative

• Operational Summary
  - Over 30,000 Data Comm ops per week (over 6000% growth in operations from January 2016 to May 2017)
  - Participation from 12 mainline US carriers, 35 international carriers, 39 business jet operators, and general aviation
  - 41 different aircraft types using Data Comm
Tower Service Ops Summary

12 US Mainline Air Carriers
- American Airlines
- United
- Hawaiian Airlines
- FedEx
- JetBlue
- Delta
- Alaska
- UPS
- American

35 International Air Carriers

41 Aircraft Types

30,000+ Flights per week (June ‘17)

Data Comm Operations per month
Data Comm - Equipage Status

- 3,053 Data Comm equipped aircraft operating in the NAS as of June 10, 2017
  - Includes FANS/VDL-2, FANS/POA, business jets, and international aircraft

- 1,359 aircraft have been equipped through the Data Comm equipage initiative
Data Comm En Route
Initial Services Challenge Waterfall

[Map of the United States with numbered locations and dates, indicating the progress of the challenge]

1. ZKC 10/1/18
2. ZME 10/15/18
3. ZID 11/1/18
4. ZTL 3/1/19
5. ZAU 3/15/19
6. ZFW 3/29/19
7. ZMP 4/12/19
8. ZDB 4/26/19
9. ZNY 5/10/19
10. ZDC 5/24/19
11. ZBW 7/12/19
12. ZJX 7/26/19
13. ZMA 8/16/19
14. ZHU 8/30/19
15. ZAB 9/13/19
16. ZDV 9/27/19
17. ZLA 10/11/19
18. ZLC 10/25/19
19. ZOA 11/8/19
20. ZSE 11/22/19
Data Comm – Risks

• **Integration and test of the component subsystems**
  – ERAM/TDLS/DCNS/FTI/Aircraft
  – Developing risk mitigation strategies to address packaging challenges in ERAM releases

• **Air-to-Ground interoperability**
  – Interoperability testing has discovered latent avionics issues critical to En Route implementation
  – Developed ground based workaround and mitigations strategy to allow all aircraft to participate in en route services
  – Avionics fix is still required to address the interoperability issue

• **Training**
  – Development and acceptance of training materials
  – Timing of training to support initial En Route operations (Air Traffic and Tech Ops training in ERAM)
  – Operator flight crew training to support the waterfall

• **Operator support for the En Route waterfall**
  – Equipped aircraft needed to support Data Comm ARTCC site IOCs
  – Support for FAA air-to-ground interoperability site testing

• **Site coordination**
  – Coordination across multiple facilities and with operators to support transition to Data Comm En Route Initial CPDLC Services
Multiple Runway Operations

Industry Leads:
Glenn Morse, United Airlines
Jon Tree, Jeppesen/Boeing

FAA SMEs:
Jack Allen, FAA
Paul Strande, FAA
NextGen Priorities: Multiple Runway Operations
Removal of Vertical Navigation

- NAC recommended removal of VNAV requirements for parallel approaches;
- FAA included in NextGen Priorities
- FAA is prepared to authorize procedure changes to meet the planned Q3 2017 commitment
- ALPA has raised safety concerns related to regional Safety Impacts
  - Explore exceptions without implementing national standard
  - VNAV supports longer term NextGen Strategy
- FAA needs NAC input on whether to proceed with implementing a national standard
DISCUSSION
Back-up
Multiple Runway Operations Focus Area Status

• Multiple Runway Operations Working Group is being put into “hibernation”
  + MRO capabilities have been part of our FAA portfolio since before the NextGen Priorities were developed and will continue to be part of our portfolio
  + MRO has been successful because of the communication between the FAA and industry; we will keep working with industry on all MRO activities

Multiple Runway Operations Commitments Status

• Wake RECAT Phase II implementation
  - MSP and MIA implementations complete and delivering benefits
  - Activities are underway for IAD implementation in Q3 2017

• Dependent Procedures
  - Procedure authorization work is on track for 7110.308A stagger reduction at SFO by Q2 2017 commitment date

• Wake RECAT Phase II benefits analysis
  - Analysis is complete and FAA is reviewing results
Multiple Runway Operations
Industry Commitment Status

- MRO industry team participation in JAT assessments of IND and PHL is complete

- Assessment of LAX is in progress and will require continued industry support
Performance Based Navigation

**Industry Leads:**
Steve Fulton, Sandel Avionics
Brian Townsend, American Airlines

**FAA SMEs:**
Donna Creasap, FAA
Josh Gustin, FAA
NextGen Priorities: PBN Navigation
Mixed Equipage

- PBN NAS NAV Strategy endorsed by PARC and NAC in 2016
  - Requires vertical navigation capability by 2025
  - Concern with regionals ability to meet expectations in the projected timeframe

- high levels of equipage (operators) and procedures/automation (FAA) are needed for operational benefit

- Seeking affirmation that operator commitment extends to regional carrier fleets and some mainline aircraft

- Could affect near term use of Established on RNP
DISCUSSION
Back-up
PBN NIWG Pre-Implementation Milestones: Q2 2017

• EoR Independent Operations Safety Analysis (RF Duals and Triples)
  ✦ Milestone complete

• EoR Independent/Dependent Operations Capacity Analysis
  ✦ Milestone On Track

• RNP-1 Departures (BUR & SNA)
  ✦ Milestone complete
Surface Team

Industry Leads:
Rob Goldman, Delta Air Lines
Steve Vail, Mosaic ATM, Inc.

FAA SMEs:
Susan Pfingstler, FAA
Mike Huffman, FAA
NextGen Priorities: Surface

• Data
  • Foundation of Traffic Flow Management (TFM) and Trajectory Based Operations (TBO) and on going focus of NIWG surface group
  • Industry submission of 11 surface data elements progressing well
  • Airport CDM / data submission needs to be resolved
  • SWIM “data dictionary action” has the right definition and can leverage multiple processes already underway into a complete and repeatable package

• Terminal Flight Data Manager (TFDM)
  • Industry engagement and participation will accelerate around implementation
  • ATD-2 project is producing significant positive results and the learning transfer will be key benefit for the TFDM program

• SWIM Visualization Tool
  • Relatively inexpensive updates can significantly benefit current tool
    • Example: Use gate information (from 11 data elements) and display for tower controllers
NextGen Priorities: Surface Data Exchange

Continued engagement to support recent successes in the Surface NIWG

- Leverage opportunities from the early provision of 11 Data Elements
  - Exploit the pool of pre-TFDM implementation benefits
  - Delta and American delivering quality data
  - Jet Blue, United and FedEx making good progress with the SWIM on boarding process
  - Possible Swim Surface Visualization Tool changes to display additional data
- On track with the majority of FY17 NAC commitments
  - Data Sharing: Airports involved in Collaborative Decision Making
DISCUSSION
Back-up
Surface Ops & Data Sharing Commitments

• Completed Commitments:
  ✓ Plan to Deliver TFDM Capabilities to Key Sites as Early as Possible – Q3 2016
  ✓ Plan to Move Up the TFDM Build that Subsumes DSP within the Overall TFDM Waterfall – Q3 2016
  ✓ Restoration of Original FY18-20 Funding for the TFDM Program and Contract Award – Q3 2016
  ✓ Identify Forum for On-Going Industry Engagement with FAA Throughout TFDM Deployment – Q4 2016
  ✓ Data Sharing: Flight Operations to provide 11 data elements – Q4 2016
  ✓ Data Sharing: Airports select four initial pilot airports – Q3 2016
  ✓ Lead Operator, American Airlines to provide data for CLT surface departure management – Q2 2017
Surface Ops & Data Sharing
2017 Commitments

FAA Commitments

- Surface Departure Management Demonstration Charlotte (ATD-2) – Q4 2017
  - On Track – ATD-2 Phase 1 Demonstration to start by the 4th quarter. The Advanced Electronic Flight Strip (AEFS) at CLT achieved IOC on June 13th.
- FAA to Increase Data Sharing providing Surface Surveillance MLAT CAT 10 data (MA and Incidental NMA) to Industry via SWIM – Q4 2017
  - On Track – All 35 sites will be completed by August 2017
- FAA to jointly work with industry to develop a SWIM “Data Dictionary”
  - February 2017 NAC Action

Industry Commitments

- Data Sharing: Airports Supplement Actual In Block Time (AIBT), Actual Off Block Time (AOBT), Actual Take Off Time (ATOT), Actual Landing Time (ALDT) – Q3 2017
- Flight Operators Conduct Outreach to Facilitate Data Sharing Participation from Additional Flight Operators – Q3 2017
- Data Sharing: Flight Operators Provision of Specific Examples of Desired TFM Data Not Currently Available via SWIM – Q4 2017
Annual Benefits of Surface Data provision before TFDM Implementation

- Estimated annual benefit of surface 11 data element delivery (TFMS Release 13) before TFDM deployment to be between $65M and $73M (in FY2016 $)
  - This estimate leverages previous business case analyses and scientific studies that represent a logical extension of the prior analyses and the resulting improvements in TFMS

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<thead>
<tr>
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</tr>
</thead>
<tbody>
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<td>Surface CDM data producing ETD updates resulting in</td>
<td>Better TMIs</td>
<td>More Accurate TMI Start and End Times</td>
<td>$15M</td>
<td>$17M</td>
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<td>Improved Demand Predictions</td>
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<td>Improved Go/No Go Decisions for Ground Stops</td>
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<td></td>
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<td>Delay Reduction with Adaptive Compression</td>
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<td>$4.2M</td>
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<td></td>
<td>Reduction in Number of TMI Revisions</td>
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<tr>
<td>Increased Predictability</td>
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<td>Reduction in Time-Out Delays and Cancellations</td>
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<td>Improved EDCT Compliance</td>
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<td>Better Trajectory Prediction</td>
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<td>More Accurate MAP Values</td>
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<td>Reduction in Departure MITs</td>
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<td>Better Airline Decisions</td>
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<td>Better Route Selection</td>
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<td>Total</td>
<td>$35-$40M</td>
<td>$30-$33M</td>
<td>$65-$73M</td>
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# CDM User Status *(Provision of Surface Data Elements)*

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<tr>
<th>Airline/ANSP</th>
<th>SWIM Consumer</th>
<th>SWIM Publisher for TFMdata</th>
<th>Cutover to Operational Publisher</th>
<th>Status</th>
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<tr>
<td>American Airlines</td>
<td>Operational</td>
<td>Cutover to Ops</td>
<td>Complete</td>
<td>SWIM Consumer/Producer</td>
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<tr>
<td>Delta Air Lines</td>
<td>Operational</td>
<td>Cutover to Ops</td>
<td>Complete</td>
<td>SWIM Consumer/Producer</td>
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<tr>
<td>FedEx</td>
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<tr>
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<tr>
<td>Jet Blue Airways</td>
<td>Development</td>
<td></td>
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</table>

- **FedEx**: SWIM Stakeholder Meeting – Jan 2017, Kick-Off started. FedEx is now connected via VPN to FNTB and consuming data; including request(reply).
- **FedEx**: TIM conducted on 3/14. Requested a meeting with SWA to discuss status of transition from 3rd party.
- **FedEx**: Using 3rd party licensed clients. Need to establish their own client to begin FNTB testing.
- **Southwest Airlines**: SWIM Stakeholder Meeting – Feb 2017, Kick-Off started. TIM conducted on 3/14. Requested a meeting with SWA to discuss status of transition from 3rd party.
- **United Parcel Service**: SWIM Stakeholder Meeting – Feb 2017, Kick-Off started.
Surface Ops & Data Sharing Commitments  Cont’d

Surface Surveillance MLAT Cat 10 data deployment

- There are four (4) key sites:

<table>
<thead>
<tr>
<th>TRACON NAME</th>
<th>STDDS TRACON ID</th>
<th>Site Name</th>
<th>Site ID</th>
<th>Planned Site Installation</th>
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<tbody>
<tr>
<td>Yankee</td>
<td>Y90</td>
<td>Windsor-Lock</td>
<td>Y90</td>
<td>2/10/2017 (Complete)</td>
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<tr>
<td>Southern Cal</td>
<td>SCT</td>
<td>Los Angeles</td>
<td>LAX</td>
<td>3/2/2017 (Complete)</td>
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<tr>
<td>Charlotte</td>
<td>CLT</td>
<td>Charlotte</td>
<td>CLT</td>
<td>3/8/2017 (Complete)</td>
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<tr>
<td>Jacksonville</td>
<td>JAX</td>
<td>Jacksonville</td>
<td>JAX</td>
<td>4/17/2017 (Complete)</td>
</tr>
</tbody>
</table>

- 14 sites coordinated with industry for early activation:

<table>
<thead>
<tr>
<th>TRACON NAME</th>
<th>STDDS TRACON ID</th>
<th>Site Name</th>
<th>Site ID</th>
<th>Planned Site Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Cal</td>
<td>SCT</td>
<td>Los Angeles</td>
<td>LAX</td>
<td>3/2/2017 (Key Site/Complete)</td>
</tr>
<tr>
<td>Charlotte</td>
<td>CLT</td>
<td>Charlotte</td>
<td>CLT</td>
<td>3/8/2017 (Key Site/Complete)</td>
</tr>
<tr>
<td>Miami</td>
<td>MIA</td>
<td>Fort Lauderdale</td>
<td>FLL</td>
<td>5/17/2017 (Complete)</td>
</tr>
<tr>
<td>Northern Cal</td>
<td>NCT</td>
<td>San Francisco</td>
<td>SFO</td>
<td>5/19/2017 (Complete)</td>
</tr>
<tr>
<td>Honolulu</td>
<td>HCF</td>
<td>Honolulu</td>
<td>HCF</td>
<td>5/20/2017 (Complete)</td>
</tr>
<tr>
<td>Boston</td>
<td>A90</td>
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<td>A90</td>
<td>5/24/2017 (Complete)</td>
</tr>
<tr>
<td>Minneapolis</td>
<td>M98</td>
<td>Minneapolis</td>
<td>M98</td>
<td>5/25/2017 (Complete)</td>
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<tr>
<td>Detroit</td>
<td>D21</td>
<td>Detroit</td>
<td>D21</td>
<td>5/25/2017 (Complete)</td>
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<tr>
<td>Potomac</td>
<td>PCT</td>
<td>Ronald Regan</td>
<td>DCA</td>
<td>5/25/2017 (Complete)</td>
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<td>Dallas</td>
<td>D10</td>
<td>Dallas</td>
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<td>Atlanta</td>
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<td>M03</td>
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</table>

“All key sites are complete”

“9 of the top 14 sites are complete”

“Complete all 35 sites by August 2017”

All remaining sites available by August 2017
Data Dictionary - Overview

• **Goal of establishing a data dictionary:**
  - Establish service description documentation that supports end user understanding of data definitions and context of available services
  - Identify initial data package and develop use cases, associated documents
  - Begin establishing consistent artifacts each data release

• **Data Dictionary provides consolidated definitions for data produced by multiple NAS producers:**
  - Consumers are provided with large amounts of data from multiple sources
    - For example consuming flight data from TFMS, SFSDPS, STDDS, etc.
  - NAS systems providing similar information use inconsistent terminology to describe the information it is producing
    - Data elements (i.e., ETA) have different context within each system
    - For example departure time; can be push-back, or runway-departure

• **Rob Goldman proposed CDM Automation Team review of “TFMS Companion Document” as a model**
### Surface – Risks

<table>
<thead>
<tr>
<th>Domain Framework</th>
<th>Risk Category</th>
<th>Risk Description</th>
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<tbody>
<tr>
<td></td>
<td>Aircraft</td>
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<td>Airspace</td>
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<tr>
<td></td>
<td>Air Traffic</td>
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</tr>
<tr>
<td></td>
<td>Airports</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cross Cutting</td>
<td>Stakeholder provision of surface data elements</td>
</tr>
</tbody>
</table>

- If surface data are not provided, only AAL is expected to be able to participate in ATD-2 demonstration (91% CLT operations)
PBN Mixed Equipage

• PBN NAS NAV Strategy endorsed by PARC and NAC in 2016
  + NSG 1 operators capable with RNP 1, RF, and VNAV by 2025
  + Concern with regionals ability to meet expectations in the projected timeframe
• Broad agreement (workforce, operators) that high levels of equipage (operators) and procedures/automation (FAA) are needed for getting to the next level of operational benefit
• Seeking affirmation that mainline operator commitment extends to regional carrier fleets and some mainline aircraft
• Could affect near term use of Established on RNP
Joint Analysis Team Update

Ilhan Ince, American Airlines
Dave Knorr, FAA

June 28, 2017
### Significant Procedure Changes

#### Initial Optimized Profile Descent (OPD) Implementation
- KRANN, QUABN, and OOSHN

#### Second OPD Implementation
- KRANN, QUABN, and OOSHN

#### Third OPD Implementation
- KRANN to ROBUC, QUABN, and OOSHN

#### Final OPD Implementation
- ROBUC, JFUND, OOSHN

#### Procedure Changes Highlighted in red

#### Procedure Updates
- **2012**
  - GDM and ORW
  - Procedure Eliminated
    - INNDY
- **2013**
  - Procedure Update
    - ORW
- **2014**
  - Procedure Update
    - ORW and KRANN
  - Procedure Eliminated
    - SCUPP
- **2015**
  - Procedure Update
    - ORW and WOONS
- **2016**
  - Procedure Update
    - ORW and WOONS
- **2017**
  - Procedure Update
    - ORW and WOONS

---

### Table: Significant Procedure Changes

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<th>12 Jan 2012 (Approx.)</th>
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LAX & Comparison of ReCat Impacts

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<td>Separation Requirements</td>
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<td>Decreased</td>
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<td>7.7%</td>
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<td>0.4%</td>
<td>0.3%</td>
<td>0.0%</td>
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Benefits Impact *(including 757 impact)*

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<th>Cost Savings ($000s)</th>
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<td>-0.8</td>
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- LAX RECAT 2.0 implementation on 9/26/16
- ReCat only used when feasible due to challenges at LAX: construction, ATC initiatives, SoCal Metroplex
- Recommend re-evaluation at later date once LAX environment has stabilized
DISCUSSION
Summary of Meeting and Next Steps
DFO and NAC Chairman Closing Comments
Concluding Items

- Action Items
- Other Business
- 2017 Meetings
  - October 4th, hosted by United Airlines, Chicago, IL
Adjourn