Meeting Summary, June 28, 2017

NextGen Advisory Committee (NAC)

The twenty-first meeting of the NextGen Advisory Committee (NAC) was held on June 28, 2017 at FedEx Headquarters in Memphis, TN. The meeting discussions are summarized below.

List of attachments:

- Attachment 1 – Attendees
- Attachment 2 – Presentations for the Committee meeting - (containing much of the detail on the content covered during the meeting)
- Attachment 3 – Approved February 22, 2017 Meeting Summary
- Attachment 4 – NAC Chairman Report
- Attachment 6 – Goals and Priorities for Improving Operations in the Northeast Corridor Phase 1 Report

Welcome, Introduction and Chairman Report

NAC Chair Dave Bronczek opened the meeting at 8:35 a.m. welcoming the NAC members to Memphis, Tennessee. He commented on the great working relationship with Victoria Wassmer as the FAA Acting Deputy Administrator and thanked her for her leadership as NAC Designated Federal Officer (DFO). He welcomed Dan Elwell, the new Deputy Administrator/Chief NextGen Officer and NAC DFO. Next, Chairman Bronczek welcomed the new NAC member, Mike Sinnett, of Boeing.

He opened the chair report by explaining his commitment from the February meeting to improve communications with colleagues in the airline industry and maintain a liaison role with other airline CEOs. RTCA President, Margaret Jenny, and Victoria Wassmer were invited to the June meeting of the Airlines for America (A4A) Board to engage in a discussion of the work of the NAC. Coming out of the meeting, the airline leaders expressed a strong desire to speed up the implementation of NextGen, endorsed the NAC’s efforts that they feel are doing good and necessary work, and requested the FAA provide a dashboard of performance
and operational metrics. Teri Bristol, FAA, reported that work is underway for both operator-specific and NAS-wide data, and that they would have something to analyze in a few weeks.

Chairman Bronczek also expressed the importance of communication and feedback between the airlines and FAA. He conveyed the importance of the overarching goal of NextGen to achieve VMC performance in IMC conditions leading to increased predictability along with reduced delays and flying time as well as reduced emissions.

He concluded by outlining the two recommendations being presented to the NAC for consideration:

1.) Goals and Priorities for Improving Operations in the Northeast Corridor - Phase One – the result of more than 50 organizations that met formally 8 times since the NAC February meeting generated the recommendation for Goals and the metrics to evaluate the list of capability objectives that are prioritized to achieve the goals. The next step is the important development of specific implementations.

2.) Enhanced Surveillance Capabilities in FAA Controlled Oceanic Airspace this report identifies benefits and a strategy for implementing an improvement for operations in this area, also known as Space-based ADS-B.

In closing, he mentioned the FAA’s upcoming response to the NAC’s Time, Speed, and Spacing Tools recommendation.

**Designated Federal Officer Statement (DFO)**

The DFO, Dan Elwell, presented the Federal Advisory Committee Act notice that governs public meetings. NAC member introductions followed the DFO’s opening statement.

**Review and Approval of Feb 22, 2017 Meeting Summary**

Chairman Bronczek asked for consideration of the written summary of the February 22, 2017 meeting. By motion, the Committee approved the Summary (Attachment 3).

**FAA Report**

Dan Elwell opened his remarks by thanking FedEx for hosting the meeting. In addition, he thanked Victoria Wassmer for her splendid work and leadership as the DFO for the NAC. He commented on her professionalism and outstanding leadership over the past year. Mr. Elwell announced that Greg Martin has been selected as the Assistant Administrator for Communications. Greg previously served at the FAA from 2002 to 2006. In addition, Chris Brown was selected as the new Assistant Administrator for Government and Industry Affairs, and Ali Bahrami as the new Associate Administrator for Aviation Safety.

Following his opening remarks, Mr. Elwell discussed the FY18 budget for the FAA. He communicated that the budget request will allow the FAA to meet strategic initiatives and at the same time meet their mission. He commented on the importance of maintaining current
programs and supporting future programs like Data Comm, Time-Based Flow Management, the NAS Voice System, and En Route services. He also commented that the President’s budget proposal keeps the FAA’s organization and funding structure intact for FY18.

Mr. Elwell reported on the Air Traffic Control reform efforts of the Administration and the FAA’s appropriate role as a safety leader. He emphasized that the air traffic control system must be robust. The reform proposal would insulate Air Traffic Control from political interferences and the crippling effects of budget uncertainty while keeping intact the FAA’s safety oversight arm. The proposal preserves working relationships with the Department of Defense, the Department of Homeland Security, and law enforcement agencies. The proposal facilitates access to capital markets to generate funding. He stressed that the FAA has done a tremendous job delivering air traffic services, and that the FAA supports the Administration’s efforts to reform.

Mr. Elwell commented on the NAC’s efforts to initiate NextGen efforts in the Northeast Corridor (NEC). He emphasized the importance of near-term tactical actions and stakeholder involvement as key contributors to the NEC initiative, and underscored the FAA’s efforts to respond to the recommendations of the NAC. The FAA is focused on working collaboratively with stakeholders to be specific about our objectives and to identify near-term tactical actions that enable improvements. He briefly spoke to the ADS-B out requirement and the December 31, 2019 suspense date.

Next, Ms. Bristol reported on PBN implementation efforts and the FAA’s community engagement actions. Specifically, she highlighted the FAA’s action following the NAC-recommended PBN Blueprint for Success, and the positive results from the FAA’s subsequent community engagement strategy. These engagements generated buy-in from communities and their municipal leaders. She mentioned that the innovative approach generated from feedback is paying dividends. The new and improved PBN Blueprint laid the foundation for the future, creating hallmark messaging and identifying key objectives.

Following these remarks, she mentioned how the collaborative work done on the Metroplex has set the conditions for moving to time-based operations. Furthermore, she mentioned that all 11 Metroplex sites are on target or nearly completed, including the D.C., Houston, Northern California, and Charlotte sites. She thanked the labor and industry partners in implementing Metroplex and de-conflicting pathways and reducing airspace density. As a result, the FAA can now focus on transitioning to a time-based system.

She provided a status update of the Florida Metroplex. She commented that the Florida Metroplex achieves community involvement and how PBN changes will affect the airports. The project objective is to achieve success in Florida in a way that aligns with important connections in the larger National Airspace System (NAS). She highlighted that the FAA would be communicating with the aviation entities in South Florida over the next few weeks to explain how the changes will impact each individual airport. She concluded her remarks by
thanking the NAC for their support of the FAA’s efforts to reduce the complexity of the project and improve the safety of the overall system.

Next, Jim Eck introduced the Time, Speed, and Spacing Automation efforts in the national airspace. He discussed how this initiative requires all stakeholders to operate differently and apply new tools. He communicated the importance of moving beyond the efficiency metrics to the metrics of predictability. He touched upon the Time, Speed, and Spacing Working Group recommendations:

- Create a vision for the transition to a time-based system
- Develop a roadmap for that transition, and lead a culture change for all operationally responsible entities.

Mr. Eck introduced Rob Hunt and Glenn Martin who presented the FAA response to the PBN Time Speed and Spacing Automation tools. They presented the below background slide highlighting the PBN NAS Navigation Strategy. (In October 2016, the NAC provided recommendations to the PBS NAS Navigation Strategy.)

Key points from the brief included:

- Deploying automation tools for Time, Speed, and Spacing in geographical areas
- Institutionalizing change management practices
- Engaging with industry to achieve community visioning.
Discussion

Members emphasized that to be successful, the FAA must address pilot, controller, and dispatcher cultural changes and collaborate with these groups on change management, rather than simply deploying specific decision support tools.

A member followed up by asking if ADS-B In was an assumption of the vision, and if airports will have a best-equipped best-served decision matrix for PBN.

The FAA representatives responded that there is still an open business case for ADS-B In, and that a collective review and discussion occurs before any changes are implemented. As for the discussion of most capable or best served, the FAA envisions that there will be various levels of equipage that will result in a degradation of services for non-equipped aircraft as described in the PBN NAS Navigation Strategy.

A NAC member commented that benefits will lag if requisite equipage percentages are not met.

Another NAC member commended the FAA on its change-management efforts to support the overall mission. This conversation expanded from specific tools to a more holistic approach and focuses on institutionalizing change management.

One NAC member also emphasized the importance of change management, and asked how the FAA’s change management efforts will expand to the pilots who will be affected when the controllers begin to use the new decision support tools.

The FAA responded that pilot and controller collaboration is important and that throughput is important in the time-based considerations.

A NAC member responded that the air traffic controllers are looking forward to working with the carriers.

Another NAC member thanked the FAA on their efforts at NorCal and SoCal and the associated improvements. A member then commented if required navigation performance (RNP) and .3 were still a part of the PBN Strategy.

One NAC member discussed how the FAA envisions the time-based strategy for international arrivals.

A NAC member spoke to the need for controller, pilot, and facility collaboration in the NEC. They spoke to the interaction among facilities and how the efficiencies gained with NextGen improvements and time-based management can be negated quickly on the surface or at the gate. It’s critical for both pilots and controllers to understand the paradigm shift.

Dan Elwell concluded the discussion by commenting on the impressive nature of the collaboration among the NAC members.
Northeast Corridor (NEC)

Goals and Priorities for Improving Operations in the Northeast Corridor Phase One Report

NACSC Co-Chair, Tracy Lee, United Airlines, began by introducing the initial efforts of the NEC planning work group. He emphasized that adverse weather and staffing are key components of the NEC initiative. He spoke to the importance of improving the customer experience and the way in which that is evaluated by metrics. The metrics most associated with this goal are completion factor, delay versus schedule, block times, and throughput. Based on the results of a survey by NACSC members to prioritize the capabilities and objectives identified in the initial planning, de-confliction of airports and improving airport throughput are the top areas. The reports identified overarching potential hurdles and challenges associated with the NEC initiative as adverse weather and staffing levels at the NEC facilities (see slide below).

Near-Term Goals/Metrics for NEC

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<th>NEC Near-Term Goal</th>
<th>Associated Metrics</th>
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<td>• Operate full operation</td>
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<td>• Operate on time</td>
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| 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

The leadership for the Phase 2 work by a new NEC NextGen Integration Working Group team was announced. Leaders are Steve Brown, NBAA, and Warren Christie, JetBlue, as co-leads; Mark Hopkins, Delta Air Lines, as lead industry SME; FAA SMEs Rob Hunt, ATO PMO, and Robert Novia, ATO AJV.

A NAC member suggested looking at the components of block time.

Another NAC member commented that this level of analysis was good for business aviation as well.
One NAC member clarified that Phase Two will convene from June-October 2017, after which another NAC member asked if the June-October 2017 timeline was sufficient to complete the Phase 2 task.

One NAC member also spoke to the readiness levels and their impact on operations and the facilities in the northeast.

A NAC member noted the construction at the NEC airports, specifically the on-going projects at LGA and EWR, and whether they would impact planning and implementations.

One NAC member emphasized the importance of the staffing issues and readiness numbers; the member mentioned how re-development projects may impact implementation and spoke to the associated metrics and asked if there was a restrained approach from going beyond the previously approved NAC metrics. They also asked if further developing the block time metric would provide greater understanding of the variables associated with block time, and how would these discussions focus the group.

A NAC member spoke to applying weather to the agreed upon metrics and said increased staffing can be an early win, and that resources supporting dedicated staff planners can improve results. They communicated that the noise abatement efforts are key to the implementation of the NEC.

Another NAC member communicated that there are a few stretch goals identified in the follow-on phases.

And another NAC member reminded those in attendance that past initiatives like the East Coast program have been derailed because of noise abatement issues. They reminded everyone that noise abatement was last on the capability option list and cautioned to not minimize its significance because of the lower survey ranking. Ignoring it could derail the NEC effort.

**Outcome:** Chairman Bronczek called for a motion to accept the Phase One Recommendation and NAC members accepted the NEC Report.

**Enhanced Surveillance Task Group: Enhanced Surveillance Capabilities in FAA Controlled Oceanic Airspace: Operational Need and Added Benefits**

Steve Brown presented the Enhanced Surveillance Task Group Final Report (Attachment 5). He emphasized the unique characteristics of enhanced surveillance in oceanic airspace and the importance of a time-based system for ADS-B. He summarized the benefits of enhanced surveillance and the interoperability requirements associated with employing the service. He highlighted the key recommendations presented below:
Mr. Brown emphasized the report did not take a full view of agency investment because the team lacked sufficient information to do so; the FAA will need to consider how this investment fits into FAA’s overall investment. He reported that the international community is driving toward 15/15-mile separation and is working on standards. The NACSC is willing to engage when the timing is right to continue the dialogue. SMEs and the supplier community participated in conversations over the last eight months that analyzed the oceanic segments. He concluded his briefing by thanking the collaborative efforts of all the Enhanced Surveillance Task Group (ESTG) participants.

A NAC member emphasized that the FAA has committed a lot of effort to this initiative and that the ESTG is dependent on ADS-B equipage.

Another NAC member suggested that infrastructure dollars be considered to accelerate the implementation of ESTG.

**Outcome:** Chairman Bronczek asked for consideration of the ESTG Final Report. The report was received and approved by the NAC members.

**ADS-B Equipage – Ryan Hartman and Paul McDuffee**

Ryan Hartman and Paul McDuffee of Insitu presented the UAS Equipage status report. Mr. McDuffee discussed the challenges of equipping the entire UAS fleet. While there is universal acceptance that ADS-B equipage is a part of the future of UAS, the UAS community is waiting on the technology. He emphasized the work dedicated to constructing the performance standards for certified equipage on UAS. The technical standard order (TSO) requirements for miniature ADS-B out units must be amended to support UAS growth. Mr. Ryan Hartman
commented that the suppliers and the FAA will continue collaboration and communication efforts. He stated that the changes in detect and avoid will have a tremendous effect on the reporting numbers.

The following information was presented:

**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

**Discussion:**

A NAC member asked about TSO certification of units and the associated airframes and how the TSO certifications are being developed to support new equipage.

Another NAC member asked if the max payload requirement of 55 lbs includes the payload.
While another NAC member asked if the discussion of manual and continuous ADS-B out requirements were being considered.

One member commented that the Drone Advisory Committee (DAC) should take on the responsibility of working the equipage requirements for UAS.

**Outcome:** Insitu will provide progress and planning updates at the October NAC meeting, and the NAC members agreed to refer certification of UAS to the DAC.

**Equip 2020/ADS-B Equipage – Bruce DeCleene**

Bruce DeCleene, FAA, presented the FAA’s status report of US air carrier installations to date along with the voluntary submitted plans from airlines. He emphasized the importance of gathering the updated airline equipage plans.

The General Aviation (GA) aircraft equipage is determined by the owner’s decision to equip and is largely an education and communication issue. A member reminded the NAC that when the Mode-C mandate was presented, only 50 percent of aircraft were equipped at the time of the mandate; however, the percentage has risen to 90 percent over time.

The following portion occurred later in the meeting, but related to Department of Defense ADS-B equipage:

A member spoke to the plan to equip the Air Force fleet and anticipates that by 2025 68% of the Air Force aircraft will be equipped. The Air Force is making efforts to comply to meet the requirements.

Ms. Bristol stated that the ATO is working on a memorandum of understanding (MOU) with the DoD.

**Outcome:** The FAA will continue reporting on ADS-B equipage and there will be extensive outreach during the summer to the GA community to equip.

**NextGen Priorities Status – NextGen Integration Working Group Out-Briefs**

Jim Eck opened the NIWG reporting briefs by introducing the Northeast Corridor Working Group. In addition, he communicated that the Multiple Runway Operations Working Group would remain in a hiatus state, but the work and reporting would continue.

**DataComm**

FAA SMEs: Jesse Wijntjes, Juan Narvid

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

Chuck Stewart presented the DataComm implementation report outlined in the slide below.
Mr. Stewart outlined the DataComm avionics issues associated with the Pegasus 1 Flight Management System for the upcoming En Route services aspect of the DataComm program. The impact of this is that the B757 and B767 aircraft will not be able to receive re-routes while airborne. A temporary ground mitigation has been developed, but he emphasized this is not a long-term solution.

**Outcome:** The industry and the FAA will continue working to identify a long-term solution for the B757/767 issue and report back to the NAC.

**Multiple Runway Operations**

**FAA SME:** Paul Strande

**Industry Leads:** Glenn Morse, United Airlines; Jon Tree, Jeppesen

Paul Strande and Glenn Morse presented the VNAV requirements for parallel approaches (see slide below). The FAA is prepared to authorize procedure changes to meet the planned Q3 2017 commitment. ALPA has raised concerns related to regional safety impacts. The MRO Team has asked for input on how to move forward with the procedure change.
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:

A member commented on the challenge of flying a calculated and displayed glide slope and emphasized the increased cockpit workload when flying non-vertical guidance approaches. They commented on the need for precision approaches during parallel approach procedures and the balance of throughput.

A member spoke to the ability of getting information and feedback from the regional carriers on this issue.

A member offered support in ALPA’s position as expressed in the briefing.

A member stated that a navigation capability inventory is needed for the regional fleet and noted that the regional operators would be retiring many older aircraft within the next three years.

A member commented that there is a middle ground, a way to work through this issue, and that the lack of VNAV capability is not necessarily unsafe.

A member commented that non-precision approaches are safe, but made the distinction that parallel non-precision approaches are potentially unsafe.

A recommendation from a committee member was made that the FAA delay the implementation of VNAV procedure changes.

A member recommended that a working group further consider this issue before moving forward with implementation, in addition to reviewing potential solutions in the short-term.
A member recommended that the FAA not implement a national standard.

A member identified that this was a throughput and potential safety issue emphasized in a public forum.

A member recommended that the implementation be paused until more information and feedback is gathered.

A member emphasized the need to understand the equipage levels of the regional air carriers.

A member asked from a macro perspective, what was the effect of slowing the implementation?

Glenn Morse communicated that the lack of equipage in certain fleets, in regard to glide slope outages, might affect the air traffic flow at the airports.

ALPA agreed that non-precision approaches are safe but the distinction lies in not having VNAV capability during parallel approaches.

**Outcome:** The NAC agreed to remove the NextGen Priorities MRO milestone to publish a National Standard that removes the VNAV requirement for parallel approaches.

**Performance Based Navigation**

FAA SMEs: Donna Creasap, Josh Gustin

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

Steve Fulton presented the PBN NIWG report (see slide below). His report emphasized the need for vertical navigation capability in implementing PBN procedures that deliver value. The PBN NIWG agrees that the aircraft’s ability to connect to the airport through shorter paths is a valuable capability. The brief highlighted the need for high-level equipage rates to take advantage of the PBN technologies. The FAA communicated that a high-level of participation was required to implement the PBN procedures. The PBN group seeks affirmation from the operators that their commitment extends to regional carrier fleets. Mr. Fulton briefed that PBN implementation plans may be in jeopardy until a way forward and consensus are achieved.
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:
A member commented that the issue of mixed equipage and the varied capabilities of aircraft is magnified on IFR weather days when the glide slope is down.
A member commented on the desire not to delay if there is a benefit to track to fix (TF).
A member asked if the level of equipage and the overall effect has been tied to specific facilities.
Chairman Bronczek emphasized the need to move forward with the PBN NIWG work.
A member commented that Safety Management System data is important to analyze.
The NAC agreed that the Committee continue to examine the impacts to the Established on RNP (EoR) milestones identified by the PBN NIWG team and adjust the plan as needed.

Outcome: The NACSC will lead the effort to develop an inventory of PBN NAV capability for regional and mainline aircraft. This will include current equipage and plans for 2020 and 2025. In addition, an assessment by the NACSC of the effects of the VNAV concern on PBN milestones, including those related to Established on RNP, will be conducted to:

  - Evaluate goals/benefits for near-term TF implementations
  - Determine options.
Surface & Data Sharing

FAA SMEs: Susan Pfingstler, Mike Huffman

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

Rob Goldman and Susan Pfingstler presented the Surface and Data Sharing NIWG efforts. They emphasized the need for operators (including airports) to exchange data elements with the FAA that are vital to the FAA’s Terminal Flight Data Manager Program, which remains a key issue. Mr. Goldman outlined the following points:

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

Joint Analysis Team (JAT)

Dave Knorr, FAA, reviewed the ReCat impacts at IND, PHL, CLT, ORD, MDW with the initial results at LAX. He commented that LAX has immense potential for ReCat implementation. The JAT recommends moving the ReCat efforts at LAX until after runway infrastructure efforts are complete. In addition, the JAT will present their final findings on Boston OPD’s at the October NAC meeting.

**Outcome:** The Committee agreed that the JAT should defer the efforts on LAX until runway construction is finished.

Summary of Meeting and Next Steps

NAC Secretary, Andy Cebula, stated that the Committee approved the Phase 1 NEC and the ESTG Final Reports. He emphasized that equipage was the primary theme from the meeting.
and that gathering an accurate understanding of what we have in both the mainline and regional fleets is important.

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<th>Action Item</th>
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<tr>
<td><strong>Northeast Corridor Phase 2</strong></td>
<td>FAA/RTCA</td>
<td>October 2017</td>
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<td>• Develop joint FAA-Industry implementation commitments through the Northeast Corridor NextGen Integration Working Group.</td>
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<td><strong>Conduct an Inventory of aircraft fleet PBN NAV capability for regional and mainline aircraft</strong></td>
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<td><strong>Conduct an Assessment of VNAV concern effects on PBN Milestones including those related to Established on RNP</strong></td>
<td>RTCA/FAA</td>
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<td>• Evaluation of goals/benefits for near-term TF implementations</td>
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<td>• Determine options</td>
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<td><strong>Updates on Equip 2020 compliance – Standing agenda item for update on operator equipage</strong></td>
<td>RTCA/FAA AVS Insitu</td>
<td>Oct 2017 and future NAC meetings</td>
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<td>• For October: Installation facility capacity</td>
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<td>• UAS Equipage</td>
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<td><strong>Analyze NextGen implementations:</strong></td>
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<td>• OPD – BOS Final Report</td>
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<td>• DataComm Benefits Review</td>
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Closing Remarks

Victoria Wassmer thanked the members for their commitment to work on the challenging issues of NextGen implementation.

Chairman Bronczek complimented the collaborative effort of the NAC and thanked everyone for coming and adjourned the meeting at approximately 1:58.
Attendees:  
June 28, 2017 Meeting of the NextGen Advisory Committee  
Memphis, TN

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<td>Woods, Jeffrey</td>
<td>NATCA</td>
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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
FAA Report
NextGen Advisory Committee
Press and Social Media

FAA invites the public to learn about upcoming airspace and air traffic control changes for the region.
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
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>
<th>Near-Term (2020)</th>
<th>Mid-Term (2021-2025)</th>
<th>Far-Term (2026-2030)</th>
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</thead>
<tbody>
<tr>
<td>Recommendation</td>
<td>(5) Implement TSAS at 9 sites, with initial IOC in 2019 and completion by 2022.</td>
<td>(5) Deploy to remaining NSG1 Sites, and NSG2 Hub sites.</td>
<td>None</td>
</tr>
<tr>
<td>FAA Plans</td>
<td>TSAS Implementation per Approved Program Baseline</td>
<td>(5) Additional TSAS sites area candidate for TBFM WP4 (FID 2019)</td>
<td>N/A</td>
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<tr>
<td>Assessment</td>
<td>Consistent with current FAA activities/plans, but challenges remain.</td>
<td>Consistent with current FAA activities/plans, where cost/beneficial</td>
<td>N/A</td>
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</table>

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

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<th>Capability Categories</th>
<th>Average Total Rank</th>
<th>Percent 1, 2 or 3</th>
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<td>Deconflict Airports</td>
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<td>Improve Individual Airport Throughput</td>
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<td>Improve and Integrate Existing Flow Management Capabilities</td>
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<td>Improve Airspace Throughput</td>
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<td>Implement New Flow Management Decision Support Tools</td>
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<td>Improve NAS Information, Common SA</td>
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<td>Create New Noise Abatement Procedures</td>
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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

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<th>Aerospace Industries Association (AIA)</th>
<th>Garmin Ltd.</th>
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<td>Northrop Grumman Corporation</td>
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<td>Capability Objectives</td>
<td>Description</td>
<td>Sample Related Projects &amp; Programs</td>
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| **Deconflict Airports** | • Reduce or remove dependencies between New York airports that constrains 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  
• 7110.308: BOS, EWR, PHL  
• Capping and tunneling  
• Use of IDAC & IDRPs  
• MIT passbacks  
• CRDA at JFK, LGA  
• ReCat at BOS/IAD  
• EoR  
• GLS  
• EFVS  
• Use of IDAC & IDRPs  
• MIT passbacks  
• CRDA at JFK, LGA  
• ReCat at BOS/IAD  
• EoR  
• GLS  
• EFVS  
• Use of IDAC & IDRPs  
• MIT passbacks  
• CRDA at JFK, LGA  
• ReCat at BOS/IAD  
• EoR  
• GLS  
• EFVS |
| **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 | TFMS  
• Use of TBFM/RAPT/IDRP  
• Departure Pre-Scheduling  
• Utilize CTOP  
• Improve EWR/PHL metering  
• Surface data sharing  
• DSP/PDRE  
• ER Airspace Resectorization  
• ZNY Offshore Resectorization and PBN SIDs & STARs  
• Atlantic Coast Route Program (ACRP) |
| **Improve Airspace Throughput** | • Improve throughput through NEC airspace and en route airspace sectors  
• May impact separation standards, rules, etc. | • 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 | Surface/TFDM  
• Implement TSAS  
• FMS RTA/Airborne metering  
• Expand use of IDAC  
• ER DataComm/ABRR  
• Consider Time-based Separation |
| **Improve NAS Information, Common SA** | • Enhanced information to aid in planning or decision making | 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 | Procedure ideas:  
• ROBER OPD to JFK  
• Nighttime GLDMN  
• Off-peak noise efficient nighttime alt  
• DCA South SIDs  
• PBN O/W 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

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<thead>
<tr>
<th>Type of Respondent</th>
<th>Count of Responses</th>
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<td>Operator (Airlines, A4A, NBAA, AOPA, etc.)</td>
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<td>OEM (Aircraft, Avionics)</td>
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# Overall

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<tr>
<th>Capability Categories</th>
<th>Weight Avg</th>
<th>Operating a Full Operation &amp; Improving Completion Factor</th>
<th>Operating On Time &amp; Improving Delay Metrics</th>
<th>Operating Predictably &amp; Improving Throughput/Blade Time</th>
<th>13% Non-Monetizable Benefits (Noise, Accessibility, Safety, Security)</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>
<td>3.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Improve and Integrate Existing Flow Management</td>
<td>4.5</td>
<td>4.5</td>
<td>5.0</td>
<td>4.4</td>
<td>3.7</td>
<td>4.9</td>
</tr>
<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>
<td>5.1</td>
<td>4.9</td>
<td>5.1</td>
<td>4.3</td>
<td>4.2</td>
</tr>
<tr>
<td>Improve Airspace Throughput</td>
<td>4.1</td>
<td>4.7</td>
<td>4.1</td>
<td>4.5</td>
<td>3.4</td>
<td>3.9</td>
</tr>
</tbody>
</table>

## Results in Priority Order

<table>
<thead>
<tr>
<th>Capability Categories</th>
<th>Average Total Rank</th>
<th>Percent 1, 2 or 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deconflict Airports</td>
<td>5.2</td>
<td>73%</td>
</tr>
<tr>
<td>Improve Individual Airport Throughput</td>
<td>4.8</td>
<td>58%</td>
</tr>
<tr>
<td>Improve and Integrate Existing Flow Management Capabilities</td>
<td>4.5</td>
<td>42%</td>
</tr>
<tr>
<td>Improve Airspace Throughput</td>
<td>4.1</td>
<td>47%</td>
</tr>
<tr>
<td>Implement New Flow Management Decision Support Tools</td>
<td>3.9</td>
<td>36%</td>
</tr>
<tr>
<td>Improve NAS Information, Common SA</td>
<td>3.5</td>
<td>27%</td>
</tr>
<tr>
<td>Create New Noise Abatement Procedures</td>
<td>2.0</td>
<td>15%</td>
</tr>
</tbody>
</table>

## Capability Priority for Northeast Corridor

![Capability Priority for Northeast Corridor](image)
BREAK
Enhanced Surveillance Task Group
Draft Final Report

Co-Chairs:
Steve Brown, NBAA
Bart Roberts, JetBlue
United States Delegated Airspace
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 greenhouse 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>Separation Standard</th>
<th>Aircraft Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral</td>
<td></td>
</tr>
<tr>
<td><strong>50 NM</strong></td>
<td>Significant waypoint</td>
</tr>
<tr>
<td></td>
<td>ADS-C</td>
</tr>
<tr>
<td></td>
<td>- Waypoint change</td>
</tr>
<tr>
<td></td>
<td>- Lateral deviation</td>
</tr>
<tr>
<td><strong>30 NM</strong></td>
<td>ADS-C</td>
</tr>
<tr>
<td></td>
<td>- Waypoint change</td>
</tr>
<tr>
<td></td>
<td>- Lateral deviation</td>
</tr>
<tr>
<td><strong>23 NM</strong></td>
<td>ADS-C</td>
</tr>
<tr>
<td></td>
<td>- Waypoint change</td>
</tr>
<tr>
<td></td>
<td>- Lateral deviation</td>
</tr>
<tr>
<td><strong>15 NM (not approved by ICAO)</strong></td>
<td>Space-based ADS-B - TBD</td>
</tr>
<tr>
<td></td>
<td>ADS-C - TBD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Longitudinal</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10 minutes</strong></td>
<td>Significant waypoint</td>
</tr>
<tr>
<td></td>
<td>ADS-C periodic</td>
</tr>
<tr>
<td></td>
<td>- RNP 10: 27 minutes</td>
</tr>
<tr>
<td></td>
<td>- RNP 4: 32 minutes</td>
</tr>
<tr>
<td><strong>50 NM (w/ ADS-C)</strong></td>
<td>Position report every 24 minutes</td>
</tr>
<tr>
<td><strong>50 NM (w/out ADS-C)</strong></td>
<td>ADS-C periodic</td>
</tr>
<tr>
<td></td>
<td>- 14 minutes</td>
</tr>
<tr>
<td><strong>30 NM</strong></td>
<td>ADS-C periodic</td>
</tr>
<tr>
<td></td>
<td>- ZOA: 12 minutes</td>
</tr>
<tr>
<td></td>
<td>- ZNY: 10 minutes</td>
</tr>
<tr>
<td></td>
<td>- ZAN: 10 minutes</td>
</tr>
<tr>
<td><strong>23 NM (not approved by ICAO)</strong></td>
<td>ADS-C - TBD</td>
</tr>
<tr>
<td><strong>15 NM (not approved by ICAO)</strong></td>
<td>Space-based ADS-B – 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
ADS-B Equipage
Equip 2020
FAA Update

Date: June 28, 2017

Bruce DeCleene, Flight Standards Service
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

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>
</tr>
<tr>
<td>1090ES</td>
<td>22,904</td>
<td>24,566</td>
<td>1,662</td>
<td>7.26%</td>
</tr>
<tr>
<td>UAT</td>
<td>5,236</td>
<td>5,314</td>
<td>78</td>
<td>1.49%</td>
</tr>
<tr>
<td>Dual</td>
<td>860</td>
<td>798</td>
<td>-62</td>
<td>-7.21%</td>
</tr>
<tr>
<td>US General Aviation (includes EXP &amp; LSA)</td>
<td>24,173</td>
<td>25,549</td>
<td>1,376</td>
<td>5.69%</td>
</tr>
<tr>
<td>US Air Carrier</td>
<td>1,046</td>
<td>1,083</td>
<td>37</td>
<td>3.54%</td>
</tr>
<tr>
<td>Intl General Aviation[^]</td>
<td>1,831</td>
<td>1,885</td>
<td>54</td>
<td>2.95%</td>
</tr>
<tr>
<td>Intl Air Carrier</td>
<td>656</td>
<td>694</td>
<td>38</td>
<td>5.79%</td>
</tr>
<tr>
<td>U.S. Military &amp; U.S. Special Use</td>
<td>29</td>
<td>27</td>
<td>-2</td>
<td>-6.90%</td>
</tr>
</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.

100K by 2020 Goal
160K by 2020 Goal
Actual U.S. GA
Actual U.S. GA Good Installs
Attachment: ADS-B Out Version 2 Equipage (good installs) U.S. Air Carriers

Actuals vs 5K and 6K by 2020 Goals

1,083
All US Aircraft Equipage & Avionics Performance

Number of Aircraft

- Equipped
- Good Installs
- NPE Aircraft*

* Includes SIL=0
US GA Fixed-Wing Equipage and Avionics Performance

Data excludes Experimental & LSA aircraft

Equipped
Good Installs
NPE Aircraft

20,649 21,655 22,692 23,930 25,175 26,414
17,799 18,885 19,778 20,866 22,075 23,313
2,828 2,724 2,899 3,046 3,070 3,084

1-Jan-17 1-Feb-17 1-Mar-17 31-Mar-17 1-May-17 1-Jun-17
Equipage Status - U.S. Air Carrier June 1, 2017

Number of ADS-B Version 2 Aircraft

- UPS: 221
- UAL: 212
- DAL: 141
- SKW: 103
- FDX: 98
- AAL: 87
- JBU: 62
- JIA: 56
- ASH: 49
- ENY: 35
- ASA: 34
- CPZ: 20

ADS-B Equipage & Avionics Performance Update
US Experimental and LSA Aircraft Equipage and Avionics Performance

Number of Aircraft

- Equipped
- Good Installs
- NPE Aircraft
US Rotorcraft 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

1,263  1,258  1,309  1,435  1,463  1,558
1,027  1,055  1,092  1,190  1,218  1,305
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

ADS-B Equipage & Avionics Performance Update
US Aircraft with SIL = 0

Attachment 2

Number of Aircraft

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

2,624
2,595
2,580
2,573
2,561
2,630

1,182
1,186
1,190
1,186
1,187
1,189

99
86
85
100
85
88

All USA
GA
Exp & LSA
Air Carrier (Zero)
Rotorcraft
US Fixed-Wing Single-Engine (Rebate) Aircraft Equipage & Performance

Number of Aircraft

- All Rebate Criteria Equipped Aircraft
- ADS-B Compliant Aircraft
- SIL = 0 Aircraft*
- NPE Aircraft not including SIL=0*

* 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

---

**Miniaturized ADS-B Demand**

- **New Aircraft**
  - 2020: 500
  - 2021: 1,000
  - 2022: 1,500
  - 2023: 2,000
  - 2024: 2,500
  - 2025: 3,000

- **Year**
  - 2020
  - 2021
  - 2022
  - 2023
  - 2024
  - 2025

- **Legend**
  - New Small UAS w/ ADS-B requirement
  - New Manned A/C
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
Miniature ADS-B Transponders

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
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](chart.png)

- 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

### Major Applications of Small UAS

- 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

![Emergent UAS Defense Market at Insitu](image)
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
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
• **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.

- 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
- 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
- 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>
<tr>
<td>Surface CDM data producing ETD updates</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></td>
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<td>Improved Go/No Go Decisions for Ground Stops</td>
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<td></td>
<td></td>
<td>Delay Reduction with Adaptive Compression</td>
<td>$3.8M</td>
<td>$4.2M</td>
<td>$8M</td>
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<tr>
<td></td>
<td></td>
<td>Reduction in Number of TMI Revisions</td>
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<tr>
<td></td>
<td>Increased Predictability</td>
<td>Reduction in Time-Out Delays and Cancellations</td>
<td>$1.9M</td>
<td>$2.1M</td>
<td>$4M</td>
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<td>Improved EDCT Compliance</td>
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<td></td>
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<tr>
<td></td>
<td>Better Trajectory Prediction</td>
<td>More Accurate MAP Values</td>
<td>$10.5-15.5M</td>
<td>$6.5-9.5M</td>
<td>$17-$25M</td>
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<td></td>
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<td>Reduction in Departure MITs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Better Airline Decisions</td>
<td>Improved Taxi Delays</td>
<td>$3.5M</td>
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<td>$3.5M</td>
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<td></td>
<td></td>
<td>Better Route Selection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>$35-$40M</td>
<td>$30-$33M</td>
<td>$65-$73M</td>
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</table>

FAA NextGEN
<table>
<thead>
<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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<tbody>
<tr>
<td>American Airlines</td>
<td>Operational</td>
<td>Cutover to Ops</td>
<td>Complete</td>
<td>SWIM Consumer/Producer</td>
</tr>
<tr>
<td>Delta Air Lines</td>
<td>Operational</td>
<td>Cutover to Ops</td>
<td>Complete</td>
<td>SWIM Consumer/Producer</td>
</tr>
<tr>
<td>FedEx</td>
<td>Operational</td>
<td></td>
<td></td>
<td>FedEx is now connected via VPN to FNTB and consuming data; including request/reply.</td>
</tr>
<tr>
<td>SouthWest Airlines</td>
<td>Operational</td>
<td></td>
<td></td>
<td>• TIM conducted on 3/14.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Requested a meeting with SWA to discuss status of transition from 3rd party.</td>
</tr>
<tr>
<td>United Parcel Service</td>
<td>Operational</td>
<td></td>
<td></td>
<td>• Using 3rd party licensed clients.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Need to establish their own client to begin FNTB testing</td>
</tr>
<tr>
<td>United Airlines</td>
<td>Development</td>
<td></td>
<td></td>
<td>• FNTB Solace queues for FDPS, APDS, SMES, ISMC, TAIS, TBFM, NOTAMs-JMS, TFM R13, and ITWS, Web Logic TFM R13 Topics, Web Logic TFM R13 Queue ordered 5/9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• FNTB Solace queues for TFM Reply &amp; TFDM, FDPS and NOTAMS Web Services ordered 5/17</td>
</tr>
<tr>
<td>JetBlue Airways</td>
<td>Development</td>
<td></td>
<td></td>
<td>JetBlue has completed Consumer Qualification testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Consumer Qualification complete. Producer testing kicked-off on 5/31.</td>
</tr>
</tbody>
</table>
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>
</tr>
</thead>
<tbody>
<tr>
<td>Yankee</td>
<td>Y90</td>
<td>Windsor-Lock</td>
<td>Y90</td>
<td>2/10/2017 (Complete)</td>
</tr>
<tr>
<td>Southern Cal</td>
<td>SCT</td>
<td>Los Angeles</td>
<td>LAX</td>
<td>3/2/2017 (Complete)</td>
</tr>
<tr>
<td>Charlotte</td>
<td>CLT</td>
<td>Charlotte</td>
<td>CLT</td>
<td>3/8/2017 (Complete)</td>
</tr>
<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>
<td>Boston</td>
<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>
</tr>
<tr>
<td>Detroit</td>
<td>D21</td>
<td>Detroit</td>
<td>D21</td>
<td>5/25/2017 (Complete)</td>
</tr>
<tr>
<td>Potomac</td>
<td>PCT</td>
<td>Ronald Regan</td>
<td>DCA</td>
<td>5/25/2017 (Complete)</td>
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<tr>
<td>Dallas</td>
<td>D10</td>
<td>Dallas</td>
<td>D10</td>
<td>6/2/2017 (Expedited)</td>
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<tr>
<td>Atlanta</td>
<td>A80</td>
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<td>6/5/2017 (Expedited)</td>
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<tr>
<td>Orlando</td>
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<tr>
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<td>LGA</td>
<td>6/12/2017 (Expedited)</td>
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<td>Memphis</td>
<td>M03</td>
<td>Memphis</td>
<td>M03</td>
<td>6/14/2017 (Expedited)</td>
</tr>
</tbody>
</table>

“All key sites are complete”

“All remaining sites available by August 2017”

“9 of the top 14 sites are complete”

“Complete all 35 sites 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

## Domain Framework

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Risk Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft</td>
<td>Stakeholder provision of surface data elements</td>
</tr>
<tr>
<td>Airspace</td>
<td>If surface data are not provided, only AAL is expected to be able to participate in ATD-2 demonstration (91% CLT operations)</td>
</tr>
<tr>
<td>Air Traffic</td>
<td></td>
</tr>
<tr>
<td>Airports</td>
<td></td>
</tr>
<tr>
<td>Cross Cutting</td>
<td></td>
</tr>
</tbody>
</table>
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

Attachment 2
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 Update
- ORW and WOONS

### Procedure Eliminated
- SCUPP

### Procedure Update
- ORW

### Procedure Update
- GDM and ORW

### Procedure Eliminated
- INNDY

---

### Table: Significant Procedure Changes

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<td>GDM4</td>
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**Intermediate Study Period:**

- Aug 1–Nov 10, 2014

**Attachment 2**
### LAX & Comparison of ReCat Impacts

#### Separation Requirements

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<th></th>
<th>IND (ReCat 2.0)</th>
<th>PHL</th>
<th>CLT</th>
<th>ORD</th>
<th>MDW</th>
<th>LAX (ReCat 2.0)</th>
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<tbody>
<tr>
<td></td>
<td>Arrs</td>
<td>Deps</td>
<td>Arrs</td>
<td>Deps</td>
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<tr>
<td>Decreased</td>
<td>22.5%</td>
<td>23.3%</td>
<td>7.7%</td>
<td>7.9%</td>
<td>2.6%</td>
<td>3.3%</td>
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<tr>
<td>Unchanged</td>
<td>73.1%</td>
<td>72.9%</td>
<td>91.9%</td>
<td>91.8%</td>
<td>97.4%</td>
<td>95.6%</td>
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<tr>
<td>Increased</td>
<td>4.4%</td>
<td>3.8%</td>
<td>0.4%</td>
<td>0.3%</td>
<td>0.0%</td>
<td>1.1%</td>
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</table>

#### Benefits Impact (*including 757 impact*)

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<th>PHL</th>
<th>CLT</th>
<th>ORD</th>
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<td>Deps</td>
<td>Arrs</td>
<td>Deps</td>
<td>Arrs</td>
<td>Deps</td>
</tr>
<tr>
<td>Time Savings (hrs)</td>
<td>127</td>
<td>1035</td>
<td>215</td>
<td>112</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>Cost Savings ($000s)</td>
<td>321</td>
<td>2033</td>
<td>545</td>
<td>220</td>
<td>180</td>
<td>57</td>
</tr>
<tr>
<td>Total Savings</td>
<td>$2.4 million</td>
<td>$765K</td>
<td>$237K</td>
<td>$950K</td>
<td>-$34K</td>
<td></td>
</tr>
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</table>

- 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
The twentieth meeting of the NextGen Advisory Committee (NAC) was held on February 22, 2017 at The MITRE Corporation, Mclean, VA. The meeting discussions are summarized below.

List of attachments:

- Attachment 1 – Attendees
- Attachment 2 – Presentations for the Committee meeting - (containing much of the detail on the content covered during the meeting)
- Attachment 3 – Approved October 5, 2016 Meeting Summary
- Attachment 4 – NextGen Advisory Committee 2017 Membership List
- Attachment 5 – NAC Chairman’s Report
- Attachment 6 – FAA Response Letter from The Honorable Michael Huerta, FAA Administrator to the Honorable Congressmen Thune
- Attachment 7 – Joint Analysis Team (JAT) – Final Report: Performance Assessment of Wake ReCat in Indianapolis and Philadelphia and Fuel Analysis for North Texas Metroplex

Welcome and Introductions

Chairman Bronczek opened the meeting at 8:35 a.m. and welcoming the NAC members and others in attendance. He communicated his desire to bridge the communications gap between the NAC and the aviation industry. He expressed the need to take the best of NextGen and implement it in the northeast corridor. He stated that “if New York is running the rest of the country is running.” He recommended, “bolder more aggressive steps forward on ATC.” He followed these remarks by asking all NAC members to introduce themselves and
comment on their length of service on the NAC. He then commented on his goal to improve communications with his colleagues in the airline industry. He shared comments on the airline executive’s most recent visit to the White House and emphasized the support of an infrastructure package across all stakeholders.

**Designated Federal Official Statement**

The DFO, Victoria Wassmer (Acting FAA Deputy Administrator) read the Federal Advisory Committee Act notice, governing the public meeting.

**Approval of October 5, 2016 Meeting Summary**

Chairman Bronczek asked for consideration of the written summary of the October 5, 2016 meeting. By motion, the Committee approved the Summary (Attachment 3).

**Chairman’s Remarks**

The following is a summary of the remarks made by Chairman Bronczek (Attachment 5):

Chairman Bronczek began by thanking Lillian Ryals and The MITRE Corporation for hosting the meeting. He also thanked Angie Heise and Leidos for sponsoring the NAC dinner. He thanked all of the industry for their work on the NAC. He emphasized that consensus among the industry must continue to achieve success. Following this, he welcomed the new NAC Committee Members:

- Steve Dickson, Senior Vice President, Flight Operations, Delta Air Lines
- Craig Drew, Senior Vice President, Air Operations, Southwest Airlines
- Tracy Lee, Vice President Network Operations, United Airlines
- Winsome Lenfert, Acting Associate Administrator for Airports
- Wayne Schatz, Associate Deputy Chief of Staff, Operation, United States Air Force
- Kimball Stone, Vice President, Flight, American Airlines

All other NAC members and attendees from the public are identified in Attachment 1.

Next, he highlighted the many accomplishments of the NAC over the past 6 years. He mentioned the historic industry work of the Task Force 5 and how they set the conditions for success to deliver NextGen capabilities that remain critical to the modernization of the nation’s air traffic control system. He followed these remarks by highlighting the work of the NAC over three time frames: 2010-2012, 2012-2014, and 2014-2016.

Chairman Bronczek mentioned the efforts starting in 2010 and ending in 2012 that validated the concepts of Time Based Operations, initiated DataComm, established policies, performance metrics, city-pairs, and locations for NextGen implementation.
He highlighted efforts to implement Performance Based Navigation (PBN), identifying solutions to remove barriers for PBN implementation, establishing an environmental review process, and prioritizing NextGen capabilities. Next, he mentioned the 2014-2016 efforts of supporting the top 4 NextGen priorities: Data Comm, Multiple Runway Operations (MRO), PBN, and Surface implementation. He mentioned the 2016 efforts to improve community outreach for NextGen procedures and connecting to the longer-term vision of NextGen.

He followed these comments by focusing on the goals and priorities of the NAC. He mentioned the need to continue building on the strong 8-year foundation of collaboration with Task Force 5 and the NAC. In addition, he emphasized the desire to achieve VMC performance parameters in IMC conditions, which will result in increased predictability and reduced delays and emissions. He highlighted the need to concentrate on the near term operational implementations and benefits, while acknowledging the need to support the long-term NextGen vision. Chairman Bronczek mentioned how Wake ReCat is an example of a capability that provides immediate benefits and sets a path for long-term efficiencies similar to PBN. He highlighted an example of savings, mentioning the 17 million gallons of fuel from the FedEx hub in Memphis. Next, he spoke to the significance of the Decision Support tools, the Ground-based time, and the Speed and Spacing metering tools demonstrated the day before, during the MITRE tour and demonstrations.

Chairmen Bronczek initiated a discussion on New York, communicating that we need to make New York a priority given that 78% of system delays begin in the Northeast Corridor. Chairman Bronczek encouraged the NAC to recognize the challenges up front and work to mitigate them. He highlighted improving efficiency, reducing emissions, and decreasing delays as goals. Following this, the Chairman spoke to evaluating and assessing NextGen implementations, focusing on metrics. He spoke to short-term wins and successes based on measurements, establishing paths for longer-term payoffs, ensuring policy and procedures are aligned with FAA flight standards. He followed this by emphasizing accountability and how it is critical to evaluate performance against past improvements.

He spoke to the reports being presented by the Four Priority Teams: DataComm, MRO, PBN, and Surface and Data Management. He provided a preview of the Joint Analysis Team report, assessing performance improvements attributable to the implementation of select NextGen capabilities. In addition, he underscored the importance of the report on Wake Recategorization at Indianapolis International Airport and Philadelphia International Airport and the fuel impacts related to the North Texas Metroplex initiatives. He also talked about the Enhanced Surveillance Task Group and its evaluation of enhanced capabilities in oceanic airspace controlled by the FAA.
In closing, Chairman Bronczek thanked the NAC members for their commitment to implementing NextGen. He urged the group to continue participating in the close, consensus-based, transparent collaboration between the FAA and the aviation industry. He urged the NAC members to stay at the table, and make change happen. He stressed that RTCA’s collaborative, consensus-building process is the best approach to modernizing the air transportation system. He concluded by saying that 2017 would be a banner year for all of the NAC.

**FAA Report – Victoria Wassmer, FAA Acting Deputy Administrator**

Ms. Wassmer began her comments by thanking Jim Bowman, FedEx Express, for his service to the NAC and representing the cargo side of the industry. Next, she spoke to the appointment of the Honorable Elaine Chao as the Secretary of Transportation. She emphasized Secretary Chao’s wealth of public service experience, and highlighted her service as Deputy Secretary of Transportation under President George H.W. Bush, and Secretary of Labor under President George W. Bush. She pointed to the personnel changes at the Department of Transportation (DOT) and the FAA. She recognized the service of retiring FAA leaders Peggy Gilligan, Ben DeLeon, and welcomed to the NAC, acting Associate Administrator for Airports, Winsome Lenfert.

She emphasized that the FAA’s mission remains unchanged—to provide the safest, most efficient aerospace system in the world. She underscored Secretary Chao’s top priorities for the DOT: safety, infrastructure and innovation. Next, she focused her comments on hiring at the FAA. She spoke to the current hiring freeze the FAA is currently operating under and commented that she was unaware as to how long the limits would be in place, but, they are already working with the DOT to ensure the FAA is able to hire for positions allocated for public safety.

Ms. Wassmer spoke to the regulation assessment constraints directed by the administration and the hiring restraints. She mentioned that the FAA was still receiving guidance on what these orders mean for the FAA, however, she stressed that the freeze would not prevent the FAA from addressing safety issues. She pointed to the FAA’s efforts of issuing airworthiness directives and safety bulletins. Next, she accentuated the FAA’s reputation as a smart regulator and underscored the efforts of Part 23. She also spoke to the cumbersome nature of the certification standards for small general aviation airplanes. She pointed to the efforts to replace them with a new rule that maintains safety and innovation; these actions received wide-spread industry support.

Next, she called to attention the FAA’s efforts to continue to meet mission and the need to have the right tools and resources. Ms. Wassmer spoke to the FAA’s efforts to play an active
role in the reauthorization efforts to build on the FAA’s safety record, to modernize the air traffic control system and to integrate drones into our airspace. She then highlighted the work of the Drone Advisory Committee (DAC) by describing the composition of the DAC and how they are helping the FAA answer tough questions surrounding unmanned aircraft.

She summed this up by highlighting the importance of collaboration. She emphasized that collaboration is what brought the group together today and that it will help us achieve our goals. She stated that the NAC has been instrumental in driving consensus and that progress must continue. Ms. Wassmer commented on the ADS-B 2020 mandate. She applauded the work of the NAC and their efforts to ensure aircraft are equipped to participate in NextGen.

She stated that the equipage deadline will not change and that operators and aircraft owners need to prepare.

Ms. Wassmer highlighted the efforts of groups like AOPA, AEA, EAA, GAMA, NBAA, and NASAO in supporting the “Equip ADS-B” efforts. She spoke to the FAA’s efforts to work with DoD, civilian U.S. government agencies, and state-level agencies with aircraft fleets to ensure they are cognizant of the deadline and are taking steps to comply. Next, she underscored the FAA’s efforts to expand outreach efforts through engaging airport operators and aircraft owners. She requested NAC support to reach across all of the aviation industry and spoke to the need for the supplier community to get out information for production plans and capacity.

She commented on the value of collaboration, the proper use of meaningful metrics to capture the performance of NextGen, and commented on the PBN Time, Speed, and Spacing recommendations received from the NAC in October. She highlighted how PBN is key to achieving long term trajectory based operations. She said that Jim Eck would brief the vision of NextGen. She stated the importance of Enhanced Surveillance as we move toward future opportunities and flexibility in oceanic airspace.

Ms. Wassmer concluded her report by highlighting the Caribbean Initiative and DataComm tower service successes. Committee members expressed their approval of an FAA produced video montage covering recent successes of DataComm Tower Services.

Discussion:

The Chairman provided amplifying remarks on the DataComm success and opened the meeting for comments and questions concerning NextGen in the NE Corridor.

A NAC Member spoke to the modernization efforts of JFK and the support of the Port Authority of New York/New Jersey. They underscored the complex approach to implementation and to the importance of gaining buy-in with local government officials.
He/she expressed that managing the expectations of the public “is doable”, and stated that noise is always a local issue, a real issue.

The Chairman reinforced the Member’s comments by mentioning the past and current outreach efforts of the NAC in dealing with noise.

A NAC Member spoke to the origination of the Wake ReCat initiative and how an implementation considered “benign,” can make a huge impact. He/she conveyed how something that started as a simple conversation transitioned to a NAC conversation. He/she described how conversations transform into collaboration and eventual implementation.

The Chairman also emphasized how collaboration discussions at the small level can achieve great things like the NAC efforts toward the Northeast Corridor.

A NAC Member commented that they were excited about NextGen in New York and that business airports can gain improved capacity and emphasizing the need to be clear of what “fixing New York” is, and used the example of developing VFR capability in IFR conditions. He/she emphasized the need to talk specifics when we say, “fix it”. The Committee member mentioned tempering the discussion by improving safety and decreasing the environmental footprint, and that the NAC cannot fix all of New York’s issues.

The Chairman responded that the time is now to move forward with the Northeast.

A NAC Member asked what is clear when referencing the who, what, when, where, and why of NextGen, and asked if it was KPI’s, measures of performance, or measures of effectiveness. He/she said that the NAC has pushed for a long time, and is stuck in a metrics and language discussion, stuck in technology, and that implementation must remain outcome-based.

Another NAC Member mentioned the importance of focus on the Northeast and the need to be clear with what the NAC is trying to accomplish.

The Chairman conveyed that the Northeast is an easy choice. He stated that the goal is to define the 5th priority, the 5th working group, and communicate the underlying vision statement. He re-emphasized the need to make the Northeast a 5th priority and asked whether or not this new effort should be worked as combination of all four NIWG’s. He asked how this effort would be rolled out, and how is the NAC to capture the Northeast corridor implementation. He followed the remarks by requesting input from industry leaders and mentioned a possible Ad-Hoc group. He concluded with the need for FAA guidance and industry input.

A NAC Member stated that the Northeast Corridor was a worthy goal but that stakeholders need to be cautious because of the unique nature of this initiative and that other examples
do not exist. He mentioned that there may be a dip in production and challenges that may be faced. He concluded that everyone needs to be realistic and keep this in mind.

The Chairman encouraged the Member’s comments and welcomed further comments.

A NAC Member stated that given the diversity of the NAC, a good first step would be for the FAA to level-set the situational awareness of all NAC members to ensure a common understanding.

The Chairman commented that 78% of all problems emanate from the Northeast Corridor and that bold improvements are needed, and that is what the NAC is trying to accomplish.

A NAC Member followed the Chairman’s comments by mentioning the optics of metrics, the roll-out plan, and asked what has already been attempted in the Northeast.

Another NAC Member added that continuous improvement is needed instead of attempting to fix all of the problems.

The Chairman emphasized the need for continuous improvements along the way to gain momentum.

A NAC Member stated the importance of input from the NY/NJ Port Authority’s political body when level-setting begins.

The Chairman commented on the possibilities associated with a new infrastructure bill and the momentum to follow.

A Member spoke to the challenges on New York and the close proximity and interdependence of all four airports.

The Chairman said that New York is unlike any other place and that collectively, the NAC can do it. He asked that NAC members submit input to RTCA and suggested that this initiative be called the 5th priority.

A Member urged the other NAC members to submit input to RTCA as to the proper mechanism within the NAC that is capable of moving this forward.

The Chairman commented that the infrastructure bill is a high priority for the new Trump Administration.

A NAC Member asked if the establishment of a 5th priority required a vote.

Another NAC member mentioned the importance of gaining consensus at the NAC by the showing of hands in support of a 5th priority. He/she recommended that the FAA formalize, study, and approve the decision.
Chairman Bronczek offered a motion in favor of a 5th priority and all NAC members voted in favor of a 5th priority covering an initiative in the NE Corridor.

**NextGen Priorities Status, Steve Dickson, Sr. Vice President, Flight Operations, Delta Air Lines, and Melissa Rudinger, Sr. Vice President, Aircraft Owners and Pilots Association**

Captain Dickson began the discussion by encouraging the NAC members to not lose focus when transitioning to the 5th priority. He stated that the NAC cannot do this in a vacuum and should look at big picture outcomes when it comes to NextGen. He spoke to job additions and growth, in addition to gates, surface, and operational improvements. He mentioned the NIWG’s ability to track milestones of the four priorities and reminded the NAC of the previous transition period from programmatic milestones to implementation milestones and the need to address the detailed elements that affect the successful advancement in operational capabilities. He referenced the Task Force 5 efforts to identify capabilities that can be implemented that make a difference in operational performance. He also spoke to the importance of the JAT in the assessment of the implementations. Using the Atlanta Metroplex as an example, Cpt. Dickson highlighted the need to have a process for the FAA and the aviation users to review implementations and make adjustments as needed.

This is an example of the NIWG process maturing and reflecting real operations, while keeping safety and the customer at the forefront. Cpt. Dickson spoke to the importance of communities with implementations. He stressed the importance of the use of Decision Support and Traffic Management tools and emphasized that the industry is set up to respond to NIWG efforts. He said that work needs to be aligned within the NIWG to provide a vehicle to communicate with the NAC and industry. He emphasized that successful implementation requires leadership to continue to develop milestones.

Cpt. Dickson spoke to the sea of change, reminding the NAC of the small number of airlines at the table in the beginning, and now FedEx Corporation’s COO Dave Bronczek is ready to take the NAC to the next level with the Northeast Corridor initiative. He emphasized the need for a good feedback mechanism to respond to operational challenges.

The Chairman responded by commenting on Cpt. Dickson’s knowledge and experience on the NIWG. He underscored the collective responsibility to communicate with other airline CEO’s and his commitment to do so.
FAA SMEs: Juan Narvid (ANG), Jessie Wijntjes (ATO)
Industry Leads: John O’Sullivan (Harris Corporation), Chuck Stewart (United Airlines)

Mr. Wijntjes and Mr. Stewart provided an update to the DataComm Rolling Plan Milestones and the benefits being realized from the Controller Pilot Data Link Communication (CPDLC) Departure Clearance (DCL) in 2016. There are 2,681 Data Comm equipped aircraft operating in the NAS as of February 6, 2017, and 1,137 have been equipped through the FAA incentive program.

Mr. Wijntjes and Mr. Stewart provided an update to the DataComm Rolling Plan Milestones and the benefits being realized from the Controller Pilot Data Link Communication (CPDLC) Departure Clearance (DCL) in 2016. There are 2,681 Data Comm equipped aircraft operating in the NAS as of February 6, 2017, and 1,137 have been equipped through the FAA incentive program.

Mr. Stewart concluded the presentation by highlighting the risk and challenges associated with the DataComm program including:

**Air-to-Ground interoperability**
- Issue resolution between air and ground systems
- Latent avionics issues – Pegasus 1

**Training**
- Development and acceptance of training materials
- Timing of training to support initial En Route operations

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1 Highlighted names indicate the Team lead that presented to the NAC.
• Operator flight crew training to support waterfall

**Operator support for the En Route waterfall**

• Equipped aircraft needed to support Data Comm ARTCC site Initial Operating Capabilities (IOCs)

• Support for FAA air-to-ground interoperability site testing

**Integration and test of the component subsystems**

• ERAM/TDLS/DCNS/FTI/Aircraft

**Site coordination**

• Coordination across multiple facilities and with operators to support transition to Data Comm En Route Initial CPDLC Services

An issue for the EnRoute DataComm program is 771 Boeing 757/767 aircraft that equipped with the Pegasus 1 flight management system. The industry is working closely with Boeing and the FAA to determine a means to mitigate issues associated with this equipment for the EnRoute DataComm Program currently under development. Representatives from Boeing and Honeywell commented that they are working to accelerate an acceptable solution.

Responding to a question raised by a Committee member, the FAA committed to model benefits of the DCL comparing events prior to/after the implementation of DataComm services.

**Multiple Runway Operations (MRO)**

FAA SMEs: **Jack Allen (ATO),** Paul Strande (ANG)

Industry Leads: **Glenn Morse (United Air Lines),** Jon Tree (Jeppesen/The Boeing Company)

MRO Team leaders Glenn Morse and Jack Allen provided an update by highlighting the success of the Wake ReCat Phase II implementations at LAX and PHL airports. Mr. Allen said that Wake ReCat is delivering benefits at both airports. He added that the Joint Analysis Team has completed the ReCat assessments for IND and PHL, and they will require continued industry support. The status report is shown below:
Mr. Allen presented the Time-Based Separation (TBS) initiative at London’s Heathrow airport and highlighted increased pressure on the runways generated by applying TBS in strong headwinds. Mr. Allen mentioned that the FAA is currently conducting research and assessing the TBS concept at US airports.

Surface

FAA SMEs: Mike Huffman (ATO), Susan Pfingstler (ATO)

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

Surface NIWG leaders Susan Pfingstler and Rob Goldman began their presentation by briefing the Surface team’s pre-implementation commitment status. They then briefed the surface implementation commitments associated with the FAA’s efforts to increase data sharing and provide surface surveillance to industry via FAA’s System Wide Information Management (SWIM) in the fourth quarter 2017.

Mr. Goldman presented the Surface team’s efforts to facilitate the integration of Surface Operations in the NAS. He highlighted the Terminal Flight Data Manager (TFDM) which is the surface management solution for NextGen that will provide an integrated tower flight data automation system to improve controllers’ common situational awareness along with airports participating in Collaborative Decision Making (CDM).
A Committee member pointed out the need to develop a data dictionary for the 11 data elements that are being provided by the industry to the FAA and requested action by industry and the FAA. An action item is to identify the appropriate forum and begin the work.

**Performance Based Navigation (PBN)**

**FAA SMEs:** Donna Creasap (ATO), Josh Gustin (ATO)

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

Donna Creasap and Steve Fulton provided a brief of the PBN efforts for the Atlanta Metroplex. They emphasized the importance of balancing the programmatic outcomes versus the measures of effectiveness outcomes experienced by the operators. They posed a key question for discussion, “Can Atlanta maintain the implementation of PBN procedures while maintaining pressure on the runway?” Next, they briefed the PBN Milestone updates for both the pre-implementation and implementation phase for CY 2016.

They concluded the discussion by talking about the challenges of change management, stating that the work is still very human-centric and filled with conflict; they used the DataComm flight plan implementation as a positive example of work and technology.
Discussion:

A Committee Member explained the concerns about “burn-in” by operators in Atlanta and confusion between pilots and controllers that has created uncertainty about using new procedures in busy times. He/she expressed the need to use Human in the Loop testing and increase the fidelity of the aspects of the implementation.

Representatives of controllers and the FAA both commented that work is underway to resolve the issues.

Another Member spoke to the challenges and issues in any post implementation phase, while one Member spoke to the safety benefits and values of consistency and predictability. He/she mentioned the new technological advances, implementations, changes, and constraints.

Rick Dalton, Director of Airspace for Southwest Airlines was invited to address the NAC and he offered that flow management is a foundational challenge as the industry and the FAA seeks to achieve transformational gains. The limits of metering have resulted in incremental gains, or at times, even no increase in performance, a degradation. He emphasized the need for leadership to effectively apply the industry and the FAA expertise and resources necessary to achieve improvements.

In response members offered the following:

- There is power of having someone at the table versus making changes for the sake of changes.
- Airlines must come together on this issue.
- Critical to know the who, what, when, where, and why before changing procedures and approaches.
- Changing procedures can have the unintended results of decreasing capacity due to limits of flow management capabilities.
- Operators are actively engaged and it is important that the FAA recognize implementation of procedures is not the end – must ensure they are functioning and achieving the intended results.
- And finally, a Member responded to the Atlanta Metroplex and the post-implementation phase and the need to review and analyze current procedures for effectiveness. The PBN NIWG Team took an action item to develop a process for the industry to identify an effective process addressing issues that are identified after the FAA has completed the launch of procedures during the “burn-in” period.
Airline C/N/S Fleet Plans, Supply Chain and ADS-B Update

Bret Peyton, of Alaska Air; Christian Kast, of UPS; Carl Esposito, of Honeywell Aerospace; Bruce DeCleene, of the FAA; and Ryan Hartman, of Insitu, Inc. presented briefings on their respective C/N/S fleet plans, provided a Supply Chain status, and a FAA and UAS ADS-B update. These briefings are an ongoing agenda item that provides the NAC Members with an understanding of aircraft and UAS operator equipage health.

Alaska Airlines: Alaska Airlines is on track for full 2020 compliance for ADS-B.

**CNS Surveillance—ADS-B**

- Our 737 fleet today for 2020 mandate
  - 38 mandate-complaint aircraft
- On track for full 2020 compliance
  - Gen I MMR + SA-On replacement in full swing
  - Last 7 retrofits in Q4 2019
  - All new deliveries until 2018 MMR II + SA-Aware
  - 2018 deliveries MMR III + GBAS/SBAS
  - Requested Ex12555 as a contingency
  - SAPT not planned

DataComm:

- IOC Sep 18, 2016
- Equipment initiative program participant
- 60+ aircraft now equipped
- 125 737-800/900ERs EOY 2018 - All deliveries before/after 2018 equipped
- Forward fit and retrofit - All FANS 1/A VDL M2/Iridium
- All RNP 4
Navigation:

- All ASA pilots RNP AR qualified
- All ASA 737s RNP AR .1/.11
- 44 + 10 RNP IAPs and SIDs
- Promotes RNP use in NAS
- Continual improvement
  - RNP 1800 RVR
  - Linked RF

**UPS:** UPS is on track to meet the 2020 compliance mandate. The following chart outlines UPS equipage for Communications, Navigation and Surveillance.

![UPS Aircraft Equipage through 2020](image)

**Honeywell Equipment Manufacturer Snapshot:** Original equipment manufacturers (OEMs) are supporting the current supply and demand. These are adding capacity to match future demands.
- Sufficient production capacity exists to meet global demand
  - Limited excess capacity to accommodate non-linear orders and installations
  - Majority of forecasted demand is from non-U.S. operators
- 3-9-month lead time needed for order fulfilment
- Part 91 market analysis is in work

**ADS-B Capacity vs Global Demand**

**FAA Equip 2020 Update**: Bruce DeCleene communicated to NAC members that there is low aircraft equipping, according to previously provided operator plans to equip. Mr. DeCleene requested Part 121 operators provide updated equipage plans to MITRE as well as answers to the question on whether installations will be done in-house or contracted out. Good installs (those meeting the performance and testing requirements) are the only ones being counted right now. General Aviation (GA) numbers are improving, but still moving into the danger zone—there will not be installation capacity to accommodate a large number of
requests near the deadline. Although the GA rebate has helped, the FAA will have more information on the federal fleet at the June NAC meeting.

**Insitu, Inc. UAS ADS-B:** Ryan Hartman provided an update of the UAS ADS-B status. Tracking is needed for UAS that operate in rule-covered airspace. There is a need to identify barriers to equipage and compliance, and look at the availability of ADS-B transponders, including size and weight requirements for UAS. He stated that Insitu will take the lead to study, and provide a briefing at the June NAC meeting of UAS related equipage plans.

**NextGen Plan, Jim Eck, FAA Assistant Administrator for NextGen**

NAC Member Florian Guillermet, Single European Skies Air Traffic Management (ATM) Research (SESAR) Joint Undertaking (JU), began the presentation by introducing the Second Edition of the NextGen – SESAR’s State of Harmonization document to the NAC. This report was prepared by the Coordination Committee (CCOM) and was provided to all the NAC members.

Jim Eck then provided an overview of the history, context, and evolution of NextGen to the NAC. He discussed the collaborative efforts that began in 2007, and are continuing today. He mentioned that the target had not changed but that the path has been redefined through research, development and stakeholder engagement.

He continued on to Time Based Management (TBM) and Trajectory Based Operations (TBO) and commented that it is a concept based on the ability of aircraft to fly precise patterns in time and space. He mentioned that the TBO target is to balance airspace capacity with available runway capacity.

Mr. Eck also briefed on the “Keys to Success” slide, and emphasized the need for FAA NextGen to address people, infrastructure, policy/processes/procedures, and equipage. He spoke to the fundamental programs that we are building from the ground up, and said that technology can be transformative but that the transformation is in the people and the operations. He followed these comments by providing an overview of the accomplishments focusing on the infrastructure, people, equipage, and policy, processes, and procedures. He emphasized that NextGen activities were within 6 percent of planned cost and schedule metrics.

He presented the benefits of NextGen in the context of the four NAC priorities, and said that MRO efforts have reduced wake separation standards at twenty-eight airports. Regarding the future of the NAS, he spoke to being resilient, transparent, and building an agile NAS. Mr.
Eck presented a slide showing that fifty-five airport towers are currently equipped to support DataComm and presented the increased surveillance efforts through ADS-B and the lateral spacing improvements at the Atlanta Metroplex.

**Value of NextGen Capabilities and NAC Ad Hoc Group Update: Ed Bolen, NBAA President & CEO**

Ad Hoc Chair Ed Bolen presented an overview of the efforts of the Value of NextGen Capabilities and NAC Ad Hoc group and the definition of NextGen developed by the group:

“NextGen is the Aviation community working together to modernize technologies, policies and procedures in the national airspace system in order to increase capacity, reduce delays and cancellations, reduce our environmental footprint, and enhance safety, for all segments of aviation with bad weather performance equal to good weather performance”

He outlined the collaborative response to Senator Thune’s letter and requested additional participation by airlines in the AdHoc meetings.

**Joint Analysis Team (JAT) Final Report: Wake Recategorization IND & PHL International Airport, and Interim Report: Fuel Analysis North Texas Metroplex**

JAT Co-Chairs, Ilhan Ince, American Airlines, and Dave Knorr, FAA, presented the findings of JAT that evaluated the implementation of Wake Recategorization at Indianapolis and Philadelphia International Airports, and fuel impacts related to the implementation of the North Texas Metroplex.

**Wake ReCat**
- Indianapolis: >$2M in annual savings
- Philadelphia: approximately $800K in annual savings

**North Texas Metroplex Fuel Analysis**
- Dallas-Ft. Worth arrivals saved $4.5-6.5M annually from reduced level outs, but slightly increased overall fuel cost for Dallas Love Field

The NAC subsequently approved the recommendation developed by the Joint Analysis Team.

**Enhanced Surveillance Task Group Interim Report**
The Enhanced Surveillance Task Group Co-Chair, Bart Roberts, Jet Blue, presented an Interim Report on the status of the Enhanced Surveillance analysis in U.S. controlled airspace that is evaluating the needs and benefits of enhanced surveillance for oceanic airspace controlled by the FAA.

**United States Delegated Airspace**

Mr. Roberts spoke to the benefits of increased surveillance and added that initially, aircraft equipage was aligned with ground-based radar; but now, space-based receivers are being launched to track every equipped aircraft. He stated that controllers do not truly know the exact location of aircraft flying over the ocean, and that tactical control does not exist in oceanic airspace. He briefed that the Task Group is analyzing the cost-benefit of Enhanced Surveillance, and concluded that the interim analysis suggests that possible benefits include optimal routing, fuel savings, and potential increased capacity.

**Issues Identified and Work Underway:**
- Communications capability is a limiting factor for benefits
• The FAA provided benefits analysis for the Task Group, while the industry tasked Embry-Riddle to conduct analysis; it was a close match-up and additional work is underway
• ADS-B is consistent with increased use of GPS under NextGen
• Evaluating ADS-B and ADS-C for spacing improvements of 15/15 lateral/longitudinal
• Equipage requirements are driving the evaluation
• Mixed equipage is giving benefits to those who have equipped (ADS-B, FANS/CPDLC, RNP4, ADS-C)

The Enhanced Surveillance Group will work toward formulating a policy recommendation.

At the conclusion of the report, a Member asked why Traffic Collision Avoidance System (TCAS) wasn’t used as an equipage package. Mr. Roberts explained that separation is done by reporting, time based separation and surveillance.

Another Member mentioned the need for a cost-benefit analysis for all areas, to include the impacts on the Northeast Corridor.

Chairman Bronczek called for a motion to approve the interim report, and the NAC members concurred.

Summary of the Meeting and Next Steps

The NAC Secretary summarized the following actions and follow-up items from the meeting:

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<td>Chairman to maintain liaison role with other airline CEOs</td>
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Near-term steps:

- RTCA distribute write-up from the discussion
- Feedback requested from NAC members on how, what, when, and mechanism for moving forward with this initiative
- FAA/RTCA will work on developing appropriate mechanisms for moving forward by April 2017
- April due date for scoping
- Success Criteria to include Metric driven outcomes
- Include NY/NJ Airport Authority

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<tr>
<th>Equipage</th>
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<tr>
<td>ADS-B avionics supply chain being readied for 2020 mandate, to focus on Part 91 to augment February brief</td>
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<tr>
<td>Civil UAS in “rule airspace”</td>
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<tr>
<td>- Tracking needed for UAS that operate in rule covered airspace</td>
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<td>- Numbers</td>
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<tr>
<td>- Possible risk to ADS-B network</td>
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<td>- Identification of barriers to equipage/compliance</td>
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<td>- Availability of ADS-B transponders – size, weight requirements for UAS, etc.</td>
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| RTCA |
| Avionics-Honeywell, Rockwell Collins, Thales, etc. |
| MITRE |
| UAS- Insitu |

| Equip 2020 updates – June 2017 |
| Standing agenda item for update on operator equipage |
| - For June: Updated Plan for Part 121 operators |

<p>| FAA AVS |
| June 2017 and future NAC meetings |</p>
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<tr>
<th>For October:</th>
<th>Value of NextGen Ad Hoc tasked with developing a unified, clear message – demonstrating the value of NextGen capabilities being deployed as a result of the government-industry collaboration on the NAC. Increase airline engagement in Ad Hoc.</th>
<th>RTCA</th>
<th>June 2017 Report/discussion</th>
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<tr>
<td>Follow-up to discussion and approval of the Time Speed Spacing Task Group recommendation</td>
<td>FAA ANG &amp; NACSC</td>
<td>June 2017</td>
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<td>Joint Analysis Team requested to perform additional analysis:</td>
<td>RTCA FAA/Industry Joint Analysis Team</td>
<td>June 2017 and future NAC meetings based on program plan</td>
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<td>• OPD – BOS and Gary, IN - June</td>
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<td>• DataComm Benefits Review - October</td>
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<td>• PBN - EOR DEN IMC - TBD</td>
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<td>NextGen Integration Working Group</td>
<td>RTCA</td>
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<td>• Industry will take lead on identifying operational use and reporting – NIWG leadership</td>
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<td>• Surface Data Exchange – develop “Data Dictionary” for 11 Data elements - NACSC to develop and request assistance from RTCA Tactical Operations Committee</td>
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<tr>
<td>Update to Integrated Noise Model Report/Study</td>
<td>FAA</td>
<td>June 2017</td>
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**DFO and Chairman Closing Comments**

Ms. Wassmer and Chairman Bronczek both thanked the members for their participation in the meeting. Ms. Wassmer thanked RTCA for leading the Senator Thune response effort.
Other Business

A Member requested an update to the FAA’s Integrated Noise Model Study at the next NAC meeting.

Adjourn

By motion, Chairman Bronczek concluded the meeting at 2:43.

Next Meeting

The next meeting of the NAC is June 28, 2017, at the offices of FedEx in Memphis, TN.
NextGen Advisory Committee Chairman Dave Bronczek, President & COO of FedEx Corporation
NAC Meeting – June 28, 2017

Opening

- Welcome to FedEx Experience Center
- Pleased to work with all my industry colleagues on the NAC; thank you for the investment of your time and the resources of your organization is vital to this effort. Consensus among the industry must continue for success.
- Honored to work with newly appointed Deputy Administrator Dan Elwell, who will take over as the Designated Federal Official for the NAC. He has been serving as a key member of President Trump’s and DOT Secretary Elaine Chao’s transition team. A former military and airline pilot, he is known to many of us from his roles at A4A and AIA.
- Thanks to Victoria Wassmer who has provided key leadership for the NAC and the FAA
- Welcome new member: Mike Sinnett, Boeing Vice President of Commercial Airplanes Product Development
- Acknowledge VIP - Mike Britt, DOT Senior Aviation Advisor to DOT Secretary Elaine Choi who is attending the meeting
- Sec. Chao recognized the work of the NAC in her Congressional testimony earlier this month emphasizing that the FAA has been engaged with and responsive to industry, highlighting that the NAC is the most prominent avenue for industry collaboration. It advises the FAA on policy-level issues facing the aviation community in implementing NextGen and plays a critical role in defining priorities so that the FAA can focus its investments and deliver the NextGen capabilities that matter most to the customers.

Updates

- Made a commitment in February to the Committee to improve communications with colleagues in the airline industry and maintain a liaison role with other airline CEOs.
- Invited RTCA President, Margaret Jenny and Victoria Wassmer to the June meeting of the A4A Board meeting to engage in a discussion of the work of the NAC.
• Coming out of the meeting, the airline leaders expressed a strong desire to speed up the implementation of NextGen, endorsed the NAC’s efforts that they feel are doing good and necessary work, and requested the FAA provide a dashboard of performance metrics.
• Some of the ideas discussed included issues similar the metrics approved by NAC such as on-time performance, predictability (scheduled block time), throughput, flight times between city-pairs.
• NAC colleague, Teri Bristol, FAA’s Air Traffic Organization Chief Operating Officer is creating a daily operational metrics report.
• This collaboration will continue, and there is a great deal of interest in the work on the Northeast Corridor.
• Excited about the focus on the Northeast Corridor – making it a priority.
• We are aspiring to the overarching goal of NextGen to achieve VMC performance in IMC conditions leading to increased predictability along with reduced delays and flying time as well as reduced emissions. It seems that de-confliction of the 4 NY airports using RNP procedures may hold much promise and aligns with using past lessons learned in the NAC to create value in NY airspace.
• The ATC system should operate the same as a VFR day when the weather conditions are CAT I IFR. If we could accomplish this goal, we will have vastly improved the ATC system efficiency.
• Addressing bad weather, which can severely impact the Northeast is an important part of this undertaking.

Today’s Meeting
• Highlighting key actions for today’s meeting
• Two reports are being presented for approval by the Committee:
  1.) Goals and Priorities for Improving Operations in the Northeast Corridor - Phase One – the result of more than 50 organizations that met formally 8 times since the NAC February meeting generated the recommendation for Goals and the metrics to evaluate the list of capability objectives that are prioritized to achieve the goals.
    o Next step is the important development of specific implementations
  2.) Enhanced Surveillance Capabilities in FAA Controlled Oceanic Airspace this report identifies benefits and a strategy for
implementing an improvement for operations in this area. Also known as Space base ADS-B

- The FAA will respond to the NAC approved recommendation on implementing decision support tools – ground-based time, speed and spacing metering tools essential for the successful implementation of PBN in the Northeast Corridor and across the nation.
- The Committee will hear reports from Four Priority Teams working on implementations of DataComm, Multiple Runway Operations, Performance Based Navigation and Surface and Data Management.
- We will discuss the overarching theme of equipage. It is clear that mixed equipage has a direct correlation to ability to implement new capabilities. This affects controllers, drives the speed of implementations, the success and utilization.
- The Committee will also hear an interim report from the Joint Analysis Team that is assessing performance improvements attributable to the implementation of select NextGen capabilities such as Wake Recategorization and PBN.

Conclusion

- Thank you again for your commitment to the consensus process by attending today’s meeting.
- The investment of your time and the resources of your organization is vital to this effort. Consensus among the industry must continue for success – whether we are addressing policies, strategies for implementations and improving daily operations.
- Today’s full agenda promises to address the top issues related to NextGen. In that vein, I would ask presenters to respect Andy’s presentation guidelines and most importantly stick to your allotted time.
Enhanced Surveillance Capabilities in FAA Controlled Oceanic Airspace: Operational Need and Added Benefits

Final Report of the NextGen Advisory Committee in Response to a Tasking from The Federal Aviation Administration

June 2017
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Background/Introduction

In July 2016, the Federal Aviation Administration (FAA) requested the NextGen Advisory Committee (NAC)\(^1\) to assist in developing recommendations regarding the operational need and added benefits of Enhanced Surveillance in oceanic airspace.

The FAA mandated Automated Dependent Surveillance-Broadcast (ADS-B) upgrades for all aircraft operating in certain domestic airspace by 2020. The improvements in technology and enhanced surveillance capabilities are now being considered for oceanic airspace. The limitations of the current reporting system require much larger air traffic control separation distances in oceanic airspace. Enhanced surveillance capabilities\(^2\) will contribute to reducing the separation distances and may increase the overall safety, efficiency, fuel-savings, and reduce emissions for aircraft operating in U.S. controlled oceanic airspace.

To that end, the FAA is developing a business case for reduced separation minima in U.S. controlled oceanic airspace. The FAA requires input from operators that ultimately improves understanding and contributes to the development to solutions-sets for improved oceanic operations. The FAA has requested the NAC as an ideal forum to work through complex issue sets and produce consensus derived recommendations.

Accordingly, the FAA tasked the NAC with the following:

- 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

Executive Summary

The Enhanced Surveillance Task Group (ESTG) began meeting shortly after the tasking letter was received. The Task Group includes a cross section of entities that operate aircraft in oceanic airspace. The Task Group members are drawing on the expertise from the FAA and providers of services, and automation technology to gather information and develop an understanding of issues, operational concepts, technologies, and potential benefits. The Task Group created a

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1 July 15, 2016 Letter from Ms. Teri Bristol, Chief Operating Officer, Air Traffic Organization, Federal Aviation Administration to Ms. Margaret Jenny President, RTCA, Inc.

2 The Advanced Surveillance Enhanced Procedural Separation (ASEPS) Project is investigating the following surveillance alternatives as a means to reduce oceanic separation service below 30 nautical mile (NM) lateral and 30 NM longitudinal separation (30/30):
   - Space-Based Automatic Dependent Surveillance – Broadcast (ADS-B) reports
   - More frequent Automatic Dependent Surveillance – Contract (ADS-C) reports
Subgroup of operators to have discussions and review analysis that does not include those with a direct financial gain in the outcome.

The output of the ESTG is captured in the following recommendations.

**Summary of Recommendations**

- The FAA should proceed with the introduction of enhanced surveillance capability in Oceanic airspace to support seamless ATC surveillance, enabling efficiency and predictability of aircraft operators and ANSPs at a more precise level than available today.
- 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.
- The FAA should (as an ANSP) bear the financial burden 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 as a new tasking.
- 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 (RNP4) 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.

**FAA Assumptions**

The FAA provided the following assumptions they have made regarding equipage requirements.

- Aircraft will need to be equipped with Future Air Navigation System (FANS) Controller Pilot Data Link Communications (CPDLC), Automatic Dependent Surveillance-Contract (ADS-C), and Required Navigation Performance Level 4 (RNP4) capabilities to be eligible for reduced separation.
- A major benefit to operators from reduced oceanic separation is lower fuel
burn associated with operating at higher altitudes more quickly and for longer periods of time.

- In the FAA's preferred business model for space-based ADS-B service, operators would contract directly with the service provider or a third party for flight surveillance, like the way ADS-C tracking works today. However, our preliminary estimates indicate that potential benefits vary widely depending on aircraft type and route.

**Task Group Assumptions and Guiding Principles**

The ESTG worked under the following assumptions:

- Reduced separation is the predominant goal of enhanced surveillance.
- A clear statement of requirements (e.g. desired separation standards, etc.) should be established with appropriate performance standards to guide the assessment of implementation alternatives.
- Any changes in Oceanic services should provide safety enhancements, reduced risk to aviation, enhanced capacity and improved operational efficiency that are cost and environmentally beneficial to the aviation community.
- Enhanced surveillance enables and provides global tracking for both normal and distress situations and circumstances.
- Delivery of performance based separation (or ATM) capabilities should maximize the use of current equipage that is compliant with current FAA C/N/S standards with no broad-based fleet upgrades required, although minor upgrades to systems could be considered to make it more robust. This critical issue is addressed comprehensively later in the report.
- Deployment of enhanced surveillance services over the ocean will not affect the current FAA ADS-B Out 2020 mandate, nor add to the mandate, but leverage the investment by aircraft operators and provide additional benefits.
- Delivery of benefit will require comprehensive training of controllers, pilots and dispatchers, updating automation, and decision support tools.

The ESTG set the following guiding principles to help steer their work:

- The resulting set of recommendations will be transparent and objective, clearly laying out the methodology that the group employed to reach consensus on the specific recommendations.
- The final recommendation must address closing the business case for operators and the FAA.
- The recommendation endorses designing oceanic airspace that provides maximum benefit to aircraft equipped according to the assumptions stated in the task letter.
- The strategy for traffic flow management provides maximum benefit.
to aircraft eligible to operate on routes and at altitudes that afford reduced separation, and therefore greater efficiency and capacity. Those aircraft with lesser capabilities would use routes and altitudes commensurate with their capabilities.

- Transitions between air service providers should be considered as part of the integration.
- Enhanced Surveillance services will be introduced by regions or routes based on an assessment of needs, benefits and costs.
- FAA implementation of recommendations might require reducing budget allocation for lower priority initiatives or capabilities.
- Provider/Supplier input is important in the process of information gathering and understanding of issues, operational concepts, technologies and potential benefits, but entities with a direct financial gain are limited to serve as SMEs and not in the development of the final recommendation as well as any meetings/data sharing of specific cost/benefits calculations.

**Methodology**

The ESTG took the following steps in creating the recommendation:

**Strong operator participation**

- Operation and Benefits Subgroup formed to allow operators and the FAA to open conversation about cost and benefits, specific ConOps/goals for recommendation
- ESTG has identified industry reps to begin drafting of recommendation: overall statement/principles, equipage and benefits

**Leveraging FAA and Industry SMEs**

In the development of the recommendation, the ESTG received a series of informational briefings from the following entities:

- Aireon/Harris
- FAA – Concept Opns/Benefits Analysis
- Inmarsat
- International Air Transport Association (IATA)
- Iridium
- NAV Canada
- UK NATS
- Various Operators

**FAA Facilities**
The ESTG conducted on-site meetings at Oakland and New York ARTCCs about the benefits from enhanced surveillance. These meetings included SME’s from Dispatch and Controllers that discussed the analysis and potential findings with ZOA to discuss the Pacific operations and a separate meeting with ZNY to discuss the Atlantic and WATRS airspace.

Defining the Need for Enhanced Surveillance Services

The ESTG anticipates the introduction of enhanced surveillance capability would support seamless ATC surveillance, enabling efficiency and predictability of aircraft operators and ANSPs at a more precise level than available today. The following benefits categories that could be accrued from the deployment of enhanced surveillance capabilities in oceanic airspace:

- 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
- 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

The use of UPRs, coupled with reduced separation standards, promises the most significant benefit based on the analysis performed on behalf of the operator’s community. This is due in part to the existing practices of aircraft operators that are based on historical experience that has led to flight planning system programming and operational protocols that are used daily.

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3 Operational Analysis of Reduced Separation in FAA-controlled Oceanic Airspace (02/13/2017), by Vitaly S. Guzhva, Ph.D., Embry-Riddle Aeronautical University and Kenny Martin, ISA Software, briefing is included as Attachment D.
Optimized operating profiles have a direct and positive impact on fuel burn and green-house gas emissions. Benefits in this regard should be calculated based on time/flight hours of flights operating at optimum profiles. Separate benefits analyses provided for the ESTG by the FAA and Embry Riddle calculated a suite of proposed benefits supported by most operators, which includes user preferred routes (in lieu of great circle route), flight level changes, and decreased fuel burn (and fuel loading) into consideration. Variable Mach speed regimes were also studied to determine the overall benefits to operators.

The Case for Enhanced Surveillance

The ESTG and associated Ops and Benefits sub-group received in-depth information regarding potential surveillance sources in the oceanic environment. It is important to assess the equipage requirements associated with each surveillance alternative (ADS-C or space-based ADS-B), and in each case, the percentage of operators who will be capable of participating and deriving benefit. As stipulated in the Guiding Principles, the ESTG is proceeding under the assumption that airspace will be designed in such a way that aircraft equipped with the suite of capabilities described in the FAA Tasking letter would be eligible to receive optimal route, altitude and speed assignments.

The ESTG was informed by FAA that the baseline schedule for upgrading the Advanced Technologies and Oceanic Procedures (ATOP) system includes required ground ATC automation system upgrades to accomplish increased processing necessary to accommodate forecasted oceanic volume in either an ADS-B or ADS-C environment. Within the ESTG Operations and Benefits sub-group there was general agreement that the potential impact to FAA automation platforms supporting end-to-end system infrastructure will have to be assessed to appropriately evaluate system manageability of increased data and ATC’s capability to independently negotiate increased periodic transmission of aircraft information in remote areas of airspace. On this topic, the FAA briefed the sub-group of planned enhancements to ATOP and further, of how automation adaptations have out-paced oceanic traffic demand; the FAA anticipates data link transmission processing will not be an issue provided the appropriate investment in automation are made according to current plans.

Based on the following rationale, the ESTG concluded that the optimal surveillance solution would be space-based ADS-B.

Equipage – Because of the FAA’s mandate that operators flying in rule covered airspace (majority of controlled airspace) have ADS-B surveillance equipage, operators will be equipped with ADS-B capabilities.

Delivery of Enhanced Surveillance - The ESTG received information regarding testing and development of both ADS-B and ADS-C surveillance capabilities (classic ADS-C with higher
update rates\textsuperscript{4} and new equipage). According to the information provided, it is the opinion of the ESTG that 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.

- Any reduced separation standard along with an increase in the percentage of FANS equipped aircraft will reach a tipping point to justify a redesign of oceanic airspace to take full advantage of reduced separation standards.
- Reduced separation, resulting in increased capacity, increased availability of optimal altitudes, and optimal routings, while continuing to support cost index speeds, are the primary benefits from spaced based ADS-B.

One guiding principle cited by the ESTG is the necessity to consider surrounding ANSPs and corresponding Flight Information Regions (FIRs) and factor in any operational constraints that may exist due to lack of interoperability. The U.S. has established ADS-B as a rule for U.S. domestic airspace, and it is apparent that other ANSPs use ADS-B today, and many are considering requiring ADS-B or plan to use it to improve services. Therefore, it is logical for economic, operational and environmental interests to be consistent with the global air navigation plan\textsuperscript{5} as the US evolves ATM capabilities. Operators may be able to leverage the ADS-B avionics required for U.S. airspace to gain benefits from ADS-B in other ANSPs airspace as those other ANSPs consider requiring ADS-B domestically or leveraging ADS-B in procedural airspace.

Validation of ADS-B services and related programs should be evaluated on an airspace by airspace basis. The ESTG sub-group was briefed regarding visits to ZOA and ZNY by aircraft operational representatives to collaboratively discuss with ATC management and line controllers the effect and potential benefits of enhanced surveillance in oceanic airspace. The ESTG considered that the differences and dynamics in each oceanic airspace area would need to be closely evaluated on the basis of several characteristics, including but not limited to:

\textsuperscript{4} There was a fundamental disagreement between the industry and the FAA about the nature of ADS-C as surveillance using via HF.

\textsuperscript{5} ICAO Aviation System Block Upgrades (ASBU) references:

\begin{tabular}{l}
ASEP & Airborne Separation (ASEP) \\
Block 0 & ASEP-B0/1 Cockpit Display of Traffic Information \\
Block 0 & ASUR-B0/1 ADS-B OUT (aircraft capability) \\
Block 0 & ASEP-B0/2 ADS-B IN equipment/function compliant with DO-317A/ED194 (and subsequent versions) \\
& is required to support AIRM and VSA \\
Block 1 & ASEP-B1/1 FIM equipment /spacing functions with advisories \\
Block 1 & ASEP-B1/2 ATC support tools for ASEP-B1 (IM) \\
Block 1 & ASEP-B1/3 Interval Management Procedure published for the operating environment \\
\end{tabular}
traffic flows, aircraft equipage (and mixed equipage) and rate of additional equipage, airway structure, airspace capacity, flight data processing systems, forecasted traffic demand, flexibility of ATC and flight planners and development of “tipping point” type thresholds to detect and anticipate when different or new separation minimums would be most beneficial. In view of the aforementioned considerations, space based ADS-B might create opportunities in terms of enhanced ATC operations, weather avoidance, flexible routing, shorter airline (flight) block schedules, better utilization of airspace (due to military restricted areas), decreased fuel burn and reduced green-house gas emissions.

It will be necessary to closely monitor the ongoing verification and validation testing of space-based ADS-B to ensure there are no impediments or delays to delivery of the capability that will enable reduced separation standards, efficient airspace design and improved service.

Enhanced surveillance, in areas throughout the world where air navigation service providers employ procedural separation, will increase efficiency and capacity. This translates to greater route flexibility during congested periods, as well as availability of optimal speed and altitude assignments. Improvements in measures related to time, distance, fuel and emissions are projected. In addition, enhanced surveillance will facilitate the goals associated with the ICAO Global Aeronautical Distress Safety System (GADSS).

Both NextGen and SESAR have committed to harmonized ATM systems. The ICAO Global Air Navigation Plan (GANP) assumes a global, cooperative effort among states in their modernization efforts. This enhanced surveillance effort must consider the direction taken by many ANSP’s worldwide, including those with airspace contiguous to U.S. FIRs, to ensure global interoperability and a seamless transition for operators from one service provider to the next.

**Costs**

The FAA Tasking letter provided the following information and questions related to costs:

- The FAA and industry need to understand whether there will be additional equipage costs beyond those associated with the January 1, 2020 ADS-B mandate, and whether there will be recurrent costs or pass-through charges for usage.
- In the FAA’s preferred business model for space-based ADS-B service, operators would contract directly with the service provider or a third party for flight surveillance, similar to the way ADS-C tracking works today. However, our preliminary estimates indicate that potential benefits vary widely depending on aircraft type and route. The FAA needs to better understand how operators would decide which aircraft, regions, and/or routes to subscribe to for surveillance services at different price points and for different charging schemes.

The ETSG offers the following in response to the FAA request for cost based on consideration of several alternatives for cost related models for the provision of space-based ADS-B surveillance.
1. Operators would contract directly with the service provider or a third party for flight surveillance. As the FAA has indicated this model would be similar in principle to that used for the current provision of ADS-C services since the early 1990s.
   • The principle advantage to the FAA is that it receives data at low or minimal cost.
   • Operators are currently investing in ADS-B Out equipage to meet the January 2020 mandate and will or would need to make additional investments:
     o An investment in FANS equipage would be required for receiving full benefits because both communications and surveillance are needed to enable lower separation standards (FANS equipage costs could range from $70-120K/aircraft)
     o Associated increased SATCOM costs for equipping aircraft with FANS providing enhanced surveillance
     o Flight Planning Software Modifications
   • NAS users paying a service charge for surveillance does not align with ICAO Document 9082 Policies on Charges for Airports and Air Navigation Services guidelines - Surveillance charges contracted with the ANSP (FAA), instead of individual NAS users, will better satisfy the ICAO 9082 key charging principles of non-discrimination, cost relatedness, transparency, and consultation
   • Payment for surveillance data by individual operators to a third-party vendor, then to have the data utilized by ANSPs on a flight-by-flight basis, introduces an unwarranted and unneeded level of financial and operational complexity
   • The associated complexity to individual NAS users having individual contracts with individual ANSP around the world does not lead to low or minimal charges agreements.

2. The FAA (as an ANSP) would bear the financial burden of surveillance costs as it does domestically as the single point of contract for a third-party provider of surveillance in the airspace the FAA controls.
   • Dependent on FAA receiving funding to provide the surveillance service
   • An ANSP (FAA) is likely to receive a more advantageous price for the surveillance service than each individual operator negotiating a rate
   • Supports integration of enhanced surveillance with adjacent FIRs
   • Enhanced surveillance services would be determined by equipage beyond ADS-B, not determined by whether an operator pays for surveillance service
   • Once modified, the ATOP system would automatically ingest data from any ADS-B transceiver equipped aircraft (not dependent on whether operator had agreement with third party vendor)
   • The FAA would follow the current operating charging structure, while remaining as the single point of service delivery in airspace under its authority.
   • Integration of ADS-B source adds a level of complexity on the surveillance vendor or service provider in the in the case that not all operators would pay for feed to FAA ATC system - FAA ingestion of data determined by service being “turned on” by an aircraft operator
Summary: The ESTG recommends that the FAA (as an ANSP) should bear the financial burden of surveillance costs as it does domestically.

a. The investment in enhanced surveillance will be subject to a business case analysis for consideration in the development of future FAA budgets. In the event no additional funding is available, the ESTG recognizes that the FAA may need to consider adjustments in other programs. 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. The ESTG recommends the FAA engages and provides interim reports to the NACSC on the development of the business case analysis.

b. ADS-B is a broadcast system implemented by the FAA as a ground based infrastructure for domestic services that will be supplemented with traditional radar capability. The work group discussed ADS-B domestically vs enhanced surveillance, non-domestic, and does not support a change in this philosophy. If space-based ADS-B will enable reduced separation then the FAA should lead the NAS in providing enhanced services just as it has done for all domestic airspace, thereby promoting benefits to NAS users. The industry has long been on record to support the 2020 ADS-B mandate, has reported in different forums (NAC, NACSC, equip 2020) of their commitment to be ready. The work group agreed it is reasonable to capitalize on that investment in other areas of the NAS.

c. The operators are willing to support the FAA with equipage plans\textsuperscript{6} that the FAA may need as it develops its business case for enhanced surveillance.

d. Industry desires that any Surveillance data available to the FAA in US controlled FIRs be made available to users, as it is today, through service agreements without fee. Whether that data is from terrestrial radar, ADS-B, space based derived ADS-B, or ADS-C.

i. If a third party / vendor enhances the surveillance data and wishes to make that available through a decision support tool or display then we expect such a provider would expect to be reimbursed for that - but industry expects FAA (ANSP) data to be available to industry as it is today even if space based ADS-B, or ADS-C expands the geographic coverage beyond where it exists today.

Equipage Related Issues

The crucial technology to allow for Enhanced Surveillance is ADS-B. According to 14 CFR 91.225 and 14 CFR 91.227, after 1 January 2020 aircraft must be equipped with ADS-B to operate in U.S. sovereign Class A, B & C airspace, within the lateral boundaries of a Class B/C airspace area

\textsuperscript{6} The industry has provided a series of briefings to the NextGen Advisory Committee outlining equipage planes for communications, navigation and surveillance. This information was used in the analysis for this report. The equipage plans will also be updated as the FAA develops its investment analysis for enhanced surveillance.
Cooperative surveillance data actively transmitted by aircraft is a commodity which should continue to be available to NAS users as heretofore, free of charge. Should a third party add value to the data and re-form it for commercial purposes, that entity is entitled to a return on its investment as determined by market forces.

While surveillance performance and ADS-B equipage are crucial, communications and navigation requirements must also be considered. Furthermore, ADS-C is required for effective Enhanced Surveillance, because aircraft “intent”\textsuperscript{7} information is necessary for ATC. It should be noted that separations in oceanic airspace are, and will remain, procedural. Currently, benefits derived for, Enhanced Surveillance for related procedural separation is limited by required communication performance (RCP). To reap the benefits of positive ATC control as employed in the domestic NAS, RCP must be improved by enhancing existing communications technologies and employing new technologies when a positive operational and/or cost-benefit is established. A case in point is the development of a push to talk solution between pilot-controller in place of communication with radio operator/third party.

Currently, substitution of SATCOM in place of one of the two required airborne HF transceivers is under consideration by a number of regulatory authorities, including the FAA. As empirical evidence of positive SATCOM performance increases, both HF transceivers may eventually be replaced by dual SATCOM installations.

The table in Appendix C describes both the presently approved and the proposed separation standards which would apply based on different, common equipage configurations which exists with operators.

Another concern is the mixed equipage scenario. Reduced separation standards may be applied to aircraft equipped with advanced avionics. However, this is complicated when FANS equipped aircraft are surrounded by a preponderance of non-FANS equipped aircraft. For example, an aircraft equipped with FANS/RNP 4 cannot receive the benefit of reduced separation standards if all the aircraft surrounding it are equipped with HF communications and surveillance limited to “significant waypoints”, because this type of equipage is limited to 50 nm lateral separation and 10 minutes longitudinal separation. So, if Enhanced Surveillance is to improve separation

\textsuperscript{7} Intent data is the ADS-C avionics report of future positions (e.g., Estimate Over and Next Position). ATOP checks current position conformance and intent by comparing the future positions and filed route and generates a warning if any future position contained in a position report is out of conformance.
procedural standards and operators thus receive that benefit, special considerations must be used to congregate aircraft with advanced equipage and isolate them from aircraft with lesser equipage. This problem is not insignificant in the WATRS area and the airspace between the US West Coast and Hawaii.

The equipage numbers below are for % of aircraft that are FANS/RNP 4 as of Dec 2016:

- North Pacific (NOPAC) - Anchorage to Far East - 98%
- POLAR and Russian Far East - 96%
- Central East Pacific (CEP) - West Coast to Hawaii - 47%
- Central Pacific (CENPAC) - West Coast to Far East - 98%
- South Pacific (SOPAC) - 95%
- WATRS Atlantic seaboard - 51%
- New York Oceanic East – 98%

Analysis of Specific Oceanic Regions
North Pacific (NOPAC)

- Current FANS equipage is at approximately 98 percent and could now be considered for RNP4 classification rather than RNP10.
- 30/30 separation applied between like aircraft when necessary
- ADS-C-CDP used within Anchorage FIR for “climb through” with minimum of 15nm with RNP4/FANS aircraft
- Volcanic activity in the Anchorage FIR and Russia Kamchatka Peninsula is disruptive to efficiency and makes re-routes complicated
- Current unidirectional routes provide use of all cardinal flight levels at 1000-foot intervals; therefore, it may be in our best interest to continue a “structured” system.
- There is an initiative for a re-structuring of the NOPAC being discussed at the Informal Pacific ATC Coordinating Group (IPACG) and Cross Polar Working Group (CPWG) with FAA/JCAB/IATA as the main stakeholders. (Meetings in May (CPWG) and September (IPACG) for further discussions)
- Reduced separation, such as 15/15 would be limited westbound unless JCAB joined the Enhanced Surveillance program. Eastbound from JCAB FIR into Anchorage and Oakland FIRs provides more efficiency
- Weather deviations are very infrequent in this airspace
• Enhanced surveillance holds prospect of compressing the existing airways structure, adding additional airways, and the potential for more opportunities to UPR further west in the Anchorage FIR to the Japan FIR (reduction of current UPR constraints)

• Flight planning systems and airline policies and culture may need to be “adjusted” to take advantage of these changes

POLAR and Russian Far East

• Current operations supported by ATOP with 10 minutes separation is required for transfers into Russia

• Communications above 80N are limited (HF or Iridium) and flight time within the FIR is as low as 6 minutes (89N)

• Traffic volumes into Russia can exceed 70 a day due to seasonal winds

• Enhance surveillance will provide more efficient routings within the Anchorage “northern” airspace, however communications capabilities will still be an issue depending on latitude and distance traveled within the Anchorage airspace

• Current FIR crossing requirements (constraints) from Edmonton to Anchorage at 141W could be reduced (with Enhanced Surveillance), and in some cases eliminated, pending communications capabilities at certain latitudes
• Russia might continue to be a major constraint due to transfer requirements of 10 minutes longitudinal separation (15nm would be possible if Russia was also using ES)
• Eastbound operations entering the Anchorage FIR would see increased efficiency and potential reduction in constraints, pending communications capability

Central Pacific (CENPAC)

• Current structure is a combination of Flex tracks (PACOTS) and UPRs with 50nm standard separation and 30/30 between like equipped FANS when possible
• Enhanced surveillance offers the potential to reduce PACOTS track generation constraints by both Oakland Center (westbound) and JCAB (eastbound) in the CENPAC resulting in more efficiencies
• High equipage rates (over 90 percent) in the CENPAC can enable more UPR operations pending JCAB joining the program
Central East Pacific (CEP)

- Lower overall FANS equipage rates will reduce potential benefits
- Six primary fixed routes between CONUS and Hawaii with the four interiors routes being unidirectional (2 westbound and two eastbound) with 1000-foot flight levels on the unidirectional routes
- Separation can be as low as 30nm with FANS equipped pairs, but as long as 10 minutes for non-equipped.
- UPRs could be considered at “low” traffic periods in both directions.
- Weather deviations are more frequent in the CEP and enhanced surveillance will provide an increase in safety for weather deviations and less reliance on “Captain’s Authority” to deviate without a clearance
- Enhanced surveillance could result in more closely spaced unidirectional tracks and consideration of non-equipped aircraft being limited to specific tracks or specific flight levels. As more equipped aircraft are introduced into this airspace further enhancements can be implemented to take of full advantage of operational benefits.
- Unidirectional routes provide greater benefit with reduced separation with 1000-foot flight levels and climbs even for non-equipped aircraft
• Enhance surveillance would reduce departure delays, especially from the Hawaiian departure points into the Oakland airspace.

South Pacific (SOPAC)

• Route structure between California, Hawaii and the South Pacific exists but generally due to fewer planned UPRs
• Separation can be as low as 30/30 depending on equipage, which is about 95 percent FANS
• Enhanced surveillance 15/15 separation minima in airspace that is generally less congested and currently utilizes UPRs
• Weather deviations are more frequent in the South Pacific and enhanced surveillance will provide an increase in safety for weather deviations and less reliance on “Captain’s Authority” to deviate without a clearance

Summary of Pacific Airspace
• Enhanced surveillance will enable significant benefits in the FAA Pacific airspace
• Safety will improve with respect to potential weather deviations and avoidance of forecast moderate to severe turbulence
• A desired outcome is a reduction in passenger and crewmember injuries based on turbulence is possible with the resulting reduced separation minima (15/15) that will enable operators to more efficiently plan routes avoiding forecast SIG weather.
• Space-based ADS-B Based Enhanced Surveillance ADB-B offers a practical path as the industry moves into the next phase of reduced separation minima. By FAA mandate, all aircraft operating in the US are required to upgrade to ADS-B by 2020 so there should be no additional surveillance equipment cost to utilize ADS-B in domestic or oceanic airspace. However, ADS-C and FANS equipage is a requirement for reduced separation.
- Space-based ADS-B also offers an opportunity for Air Navigation Service Providers (ANSPs) to consider airspace redesign as traffic increases in the region. Never has this type of surveillance, almost radar like, been available in oceanic airspace.

West Atlantic Route System (WATRS)

- Aircraft equipage rates in the WATRS is one of the lowest in procedural non-radar FAA regions. Many of these aircraft are thought of as extended domestic operations therefore the aircraft communicate mostly over HF Voice Comm with RNP 10 and 50NM Spacing. Otherwise, aircraft with FANS use SATCOM Digital communications and RNP 4 30/30nm spacing.
- Route structure in WATRS uses opposite direction traffic flows, in a higher density airspace. This is different from the Pacific operation.
- Destinations are dispersed, distance between departure and arrival cities, in the NE as well as along the Leeward and Windward Islands leading to greater opportunity for route optimization.
- WATRS airspace in prone to convective weather activity with aircraft deviations on a regular basis, as well as being the area of hurricane development from June-November.
As a result, whole routes are closed by FAA as a mitigation strategy for aircraft deviation due to lack of surveillance.

- There has been increase traffic growth in recent years compounded with continued demand forecasted growth over the next five years.
- Current route structure is designed with fixed airways. Future airspace re-design should take advantage of increased aircraft equipage capability. Current equipage levels are approx. 51%, when this increases to approx. 85% airspace re-design should be implemented to maximize benefits.
- NAS users file on structured routes and controllers keep flights on structured routes.
- Enhanced surveillance in this region would have dual benefits in today’s operation, vertical and lateral adjustments.
- WATRS airspace will have mixed level of aircraft capability for a while, as such, users will need strategic assurances that the investment made will lead to improved vertical/lateral operations, while less capable aircraft are accommodated on structured routes and altitudes.
- Near term operational improvements of Enhanced Surveillance can occur on the operational edges by augmenting back up surveillance to unreliable surveillance systems.
- Regional interoperability and harmonization to reduce longitudinal separation is a near term priority for the region.
New York Oceanic East

- 98% Equipped
- 14% of time NAT tracks published New York oceanic airspace
- Remainder airspace are on UPRs
Appendix A: FAA Tasking Letter
Ms. Margaret Jenny  
President  
RTCA, Inc.  
1150 18th Street, NW  
Washington, DC 20036

Dear Ms. Jenny:

The aviation community has expressed increasing interest in space-based Automatic Dependent Surveillance – Broadcast (ADS-B) in the oceanic environment. The FAA understands some airlines are in the process of equipping their fleets with ADS-B, and other countries continue to plan for a quick implementation. Based on the discussion at the June 2016 NextGen Advisory Committee (NAC), the FAA requests the NAC’s assistance to develop a consensus recommendation regarding the operational need and the added benefits of enhanced surveillance in oceanic airspace.

By 2020, the FAA has mandated ADS-B equipment for all aircraft operating in certain airspace. Air traffic control separation distances in oceanic airspace are much larger than domestic airspace, in part due to the limitations of current position reporting methods. With improvements in technology and enhanced surveillance capabilities, there may be an opportunity for increased benefit. Enhanced surveillance capability could result in increased safety, efficiency, fuel savings, and reduced emissions for the many aircraft crossing U.S.-controlled oceanic airspace.

The FAA is developing a business case for reduced separation minima in U.S. -controlled oceanic airspace. Several alternative approaches have been proposed to allow reduced separation. The FAA requires input from operators to better understand current constraints to oceanic operations and the potential for reduced separation minima to relieve these constraints and thereby reduce operating costs and/or improve air transportation service provision.

Budget constraints and existing priorities require an evaluation of the value of enhanced surveillance capabilities. As a deliberative body with broad industry representation, the NAC provides an ideal forum to weigh the reasons and rationale for pursuing enhanced surveillance in the context of existing priorities and potential tradeoffs.

The FAA hereby tasks the NAC to:

Evaluate the need and benefit of enhanced surveillance capabilities: The FAA requests that a new work group be formed to address the reasons and rationale for pursuing an enhanced surveillance capability in the context of established priorities and in light of the tradeoffs that may be required. The work group should be able to produce
recommendations relative to the viability, practicality and benefit to pursuing a path forward for the FAA and operators. The FAA requests the working group examine the potential benefits to operators of reduced oceanic separation minima using space-based ADS-B or other improvements to surveillance; what funding mechanisms might be used and at what cost, and what funding models might be possible if enhanced surveillance is deemed of sufficient value to pursue.

**Evaluate the Business Case:** The FAA will share assumptions on equipment requirements, including communications requirements, as part of the business case. The FAA requires insight from operators in the following specific areas:

- The FAA assumes that aircraft will need to be equipped with Future Air Navigation System (FANS) Controller Pilot Data Link Communications (CPDLC) and Automatic Dependent Surveillance-Communications (ADS-C) and Required Navigation Performance Level 4 (RNP 4) capabilities to be eligible for reduced separation. The FAA needs help in estimating the future fleet capability with FANS and RNP 4 in each of the airspace volumes being considered. The FAA also needs to better understand why many aircraft that appear to be RNP 4-capable today are not indicating that capability on their flight plans.

- The major benefit to operators in the FAA’s current business case for reduced oceanic separation is lower fuel burn associated with operating at higher altitudes more quickly and for longer periods. FAA analysts must make many operational assumptions regarding dispatcher, pilot, and controller actions (e.g., how often and when will pilots request climbs in oceanic airspace?). The FAA needs to validate these assumptions with operators.

- There may be many potential benefits of reduced oceanic separation in addition to flight at higher, more fuel-efficient altitudes. For example, more direct routes may be possible because of reduced lateral separations. The FAA needs to better understand where operators would most benefit from such route changes.

- The FAA needs to better understand how expected fuel savings might lead to reduced fuel loading.

- The FAA and Industry need to understand whether there will be additional equipage costs beyond those associated with the January 1, 2020 ADS-B mandate, and whether there will be recurrent costs or pass-through charges for usage.

- In the FAA’s preferred business model for space-based ADS-B service, operators would contract directly with the service provider or a third party for flight surveillance, similar to the manner in which ADS-C tracking works today. However, our preliminary estimates indicate that potential benefits vary widely depending on aircraft type and route. The FAA needs to better understand how operators would decide which aircraft, regions, and/or routes to subscribe to for surveillance services at different price points and for different charging schemes,
Input from industry is needed to help capture the benefits of services possible, above and beyond current operations. These benefits will complement the FAA benefits case which intends to include benefits from reduced separation, improved situational awareness, improved traffic flow management capabilities, and global tracking. The benefits should consider US airspace as well as the benefits and costs for enhanced surveillance across airspace boundaries in an integrated way.

The FAA requests an interim recommendation report at the October 2016 NAC meeting, followed by a final report no later than the June 2017 NAC meeting. The FAA will make subject matter expertise available to the NAC upon request. If you need more information or have questions about this tasking, please contact me at 202-267-1240.

Sincerely,

[Signature]

Teri L. Bristol
Chief Operating Officer
Air Traffic Organization

cc: Jim Eck, Assistant Administrator, NextGen
John Hickey, Deputy Associate Administrator, Aviation Safety
Jennifer Solomon, Assistant Administrator for Policy, International Affairs and Environment
Eduardo Angeles, Associate Administrator for Airports
## Appendix B: Task Group Members

The following organizations and entities supported the work of the Task Group.

<table>
<thead>
<tr>
<th></th>
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<td>Iridium Satellite LLC</td>
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### Appendix C: Oceanic Airspace Surveillance Performance

#### Assumptions

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<th>Separation Standard</th>
<th>Aircraft Requirements</th>
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<td>Significant waypoint</td>
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<td>30 NM*</td>
<td>ADS-C</td>
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<td>23 NM</td>
<td>ADS-C</td>
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<td>15 NM (not approved by ICAO)</td>
<td>Space-based ADS-B - TBD</td>
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<td>15 NM (not approved by ICAO)</td>
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<td>5 minutes</td>
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<tr>
<td>15 NM (not approved by ICAO)</td>
<td>Space-based ADS-B – TBD</td>
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</table>

*There are no RSP or RCP requirements for this standard; listed RSP/RCP are recommendations only.*

**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.
Appendix D: Operational Analysis of Reduced Separation in FAA-controlled Oceanic Airspace - Embry-Riddle Aeronautical University and ISA Software
Space-Based ADS-B in US

Operational Analysis of Reduced Separation in FAA-controlled Oceanic Airspace

02/13/2017

Vitaly S. Guzhva, Ph.D.
Embry-Riddle Aeronautical University

Kenny Martin
ISA Software
Outline

Executive Summary

ESTG City Pairs Discussion

All Airlines Atlantic Oceanic Region Results

All Airlines Pacific Region Results
Real time position reports of all ADS-B equipped aircraft in North Atlantic, Pacific, Arctic and other remote areas will allow to reduce separations and increase traffic throughput enabling airlines to use more efficient routes and fly at more efficient altitudes and speeds.

FAA is considering the implementation of Enhanced Oceanic Surveillance and has tasked RTCA to study possible CONOPS and identify benefits through the Enhanced Separation Task Group (ESTG).

This presentation is intended to show the range of benefits that are triggered by alternative CONOPS in oceanic airspace, in line with the CONOPS of neighboring ANSPs.

Benefits are estimated for all flights that enter US Oceanic airspace and represent savings for the entire flight (not only for the US Oceanic portion). However, about 67% of all benefits are realized in US airspace.
Fast time modeling was done using a proven RAMS Plus simulation, 2020 FAA NextGen schedules for 16 Representative Days, and removing operational constraints in line with CONOPS of neighboring airspaces.

Main modeling assumptions:

- Increased equipage by Data Link Mandate
- Neighboring ANSPs having Reduced Oceanic Separation
- Wind optimized User Preferred Routing (UPR) in US oceanic airspace that removes constraints and reduces time and distance flown
- Aircraft cruising at or above FL320 initially assigned altitude of FL300 or FL310 depending on direction of flight. Step climbs attempted in all Oceanic Airspace once per 90 min (wide body aircraft) or per 150 min (narrow body aircraft). If denied, following up requests are made every 5 minutes.

RAMS Plus simulation shows space-based ADS-B enables significant benefits by

- Allowing Reduced Oceanic Separation for FANS and non-FANS (such as HF equipped) aircraft
- Reduced distance/time by wind optimized UPRs in oceanic airspace
Modeling Overview

Baseline Equipage

- Atlantic 2020: 75% FANS (30/30), 25% HF (10 min)
- Pacific 2020: 76% FANS (30/30), 24% HF (10 min)

Test Cases Equipage

- Added FANS to aircraft penetrating Canada/Portugal border to account for Data Link Mandate (increases Atlantic 2020 FANS to 86% overall)

<table>
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<tr>
<th>Scenario</th>
<th>Benefits Case</th>
<th>Benefits Pool</th>
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<tr>
<td>Baseline</td>
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<td>Alternative 1</td>
<td>Reduced Oceanic Separation (ROS) for FANS/ADS-B Aircraft</td>
<td>ROS for FANS/ADS-B Aircraft</td>
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<td>ROS (25/60) for HF/ADS-B Aircraft</td>
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<td>25/60</td>
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<td>Alternative 3</td>
<td>Wind-optimized UPR</td>
<td>UPR for FANS/ADS-B and HF/ADS-B</td>
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Total Annual Monetized Benefits in 2020
(FY16 $ Millions; ADOC and Fuel Only, Fuel price is $2.88 per gallon by FAA guidance)

Annual Benefits for all Airlines in North Atlantic and Pacific Oceanic Airspace

- 15/15 FANS/ADS-B; 10 min HF: $39.3
- 15/15 FANS/ADS-B; 25/60 HF/ADS-B: $69.5
- 15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR: $440.5

Annual Benefits for all Airlines in US Oceanic Airspace

- 15/15 FANS/ADS-B; 10 min HF: $26.5
- 15/15 FANS/ADS-B; 25/60 HF/ADS-B: $46.8
- 15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR: $296.9

Approximately 67% of all oceanic benefits realized in US airspace
Non-Monetized Benefits

Reduced Emissions

Annual Reduction of Carbon Dioxide (Metric Tons) in 2020

- 122,310
  - 15/15 FANS/ADS-B; 10 min HF

- 203,797
  - 15/15 FANS/ADS-B; 25/60 HF/ADS-B

- 1,233,523
  - 15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR

Enhanced Global Flight Tracking

Enhanced Search and Rescue

Improved Tactical Flow Management
Economic Inputs

All values in FY16$ based on the August 2016 *Economic Information for Investment Analysis* document, produced by the FAA Investment Planning and Analysis

Fuel savings are valued at $2.88 per gallon

Non-fuel ADOC depends on aircraft type

For illustration, Passenger Value of Time for FY20 is $49.54 per hour

The number of seats depends on aircraft type

The assumed load factor is 82.9%
ESTG City Pair Discussion
Scheduled Flights

Baseline Runs

UPR Runs

Both with Conflict Resolutions
243 operations in 16 NextGen representative days (annualized to 5,543 operations per year);
Fuel is $2.88 per gallon
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<th>Per Flight</th>
<th>Average Flight Time (hours)</th>
<th>Airborne Time Savings (min)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
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<td>116,790</td>
<td>424,240</td>
<td>$541,030</td>
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</table>

$ = FY16$;
251 operations in 16 NextGen representative days (annualized to 5,726 operations per year);
Fuel is $2.88 per gallon
KPHL-TJSJ

Scheduled Flights

Baseline Runs

UPR Runs

Both with Conflict Resolutions
<table>
<thead>
<tr>
<th>Per Flight</th>
<th>Average Flight Time (hours)</th>
<th>Airborne Time Savings (min)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
<th>ADOC + Fuel Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>3.32</td>
<td>0.67</td>
<td>59.11</td>
<td>$20.01</td>
<td>$55.52</td>
<td>$75.53</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>3.32</td>
<td>0.74</td>
<td>81.66</td>
<td>$22.20</td>
<td>$76.70</td>
<td>$98.90</td>
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<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>3.28</td>
<td>2.96</td>
<td>167.64</td>
<td>$88.30</td>
<td>$157.45</td>
<td>$245.75</td>
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</table>

<table>
<thead>
<tr>
<th>Per Year</th>
<th>Total Flight Time (hours)</th>
<th>Airborne Time Savings (hours)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
<th>ADOC + Fuel Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>3,712</td>
<td>751</td>
<td>66,076</td>
<td>$22,365</td>
<td>$62,059</td>
<td>$84,424</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>3,711</td>
<td>833</td>
<td>91,284</td>
<td>$24,813</td>
<td>$85,734</td>
<td>$110,547</td>
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<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>3,670</td>
<td>3,312</td>
<td>187,393</td>
<td>$98,707</td>
<td>$176,000</td>
<td>$274,707</td>
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</table>

$ = FY16$;
49 operations in 16 NextGen representative days (annualized to 1,118 operations per year);
Fuel is $2.88 per gallon
### Per Flight

<table>
<thead>
<tr>
<th>Flight</th>
<th>Average Flight Time (hours)</th>
<th>Airborne Time Savings (min)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
<th>ADOC + Fuel Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>3.36</td>
<td>0.23</td>
<td>0.78</td>
<td>($7.00)</td>
<td>($0.74)</td>
<td>($7.74)</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>3.35</td>
<td>0.29</td>
<td>51.48</td>
<td>$8.64</td>
<td>$48.35</td>
<td>$56.99</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>3.34</td>
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<td>$30.45</td>
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### Per Year

<table>
<thead>
<tr>
<th>Flight</th>
<th>Total Flight Time (hours)</th>
<th>Airborne Time Savings (hours)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
<th>ADOC + Fuel Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>4,599</td>
<td>(322)</td>
<td>1,074</td>
<td>(9,585)</td>
<td>($1,009)</td>
<td>($10,594)</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>4,587</td>
<td>397</td>
<td>70,456</td>
<td>11,829</td>
<td>$66,173</td>
<td>$78,001</td>
</tr>
<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>4,571</td>
<td>1,398</td>
<td>76,214</td>
<td>41,672</td>
<td>$71,580</td>
<td>$113,252</td>
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</table>

$ = FY16$;
60 operations in 16 NextGen representative days (annualized to 1,369 operations per year);
Fuel is $2.88 per gallon
KLAX-PHNL (top) PHNL-KLAX (bottom)

Scheduled Flights  Baseline Runs  (Both with Conflict Resolutions)  UPR Runs
$ = FY16$;
342 operations in 16 NextGen representative days (annualized to 7,802 operations per year);
Fuel is $2.88$ per gallon

<table>
<thead>
<tr>
<th>Per Flight</th>
<th>Average Flight Time (hours)</th>
<th>Airborne Time Savings (min)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
<th>ADOC + Fuel Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>5.25</td>
<td>0.10</td>
<td>83</td>
<td>$6.77</td>
<td>$78.28</td>
<td>$85.05</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>5.25</td>
<td>0.43</td>
<td>180</td>
<td>$22.59</td>
<td>$169.08</td>
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<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>5.20</td>
<td>3.20</td>
<td>436</td>
<td>$147.95</td>
<td>$409.21</td>
<td>$557.16</td>
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<table>
<thead>
<tr>
<th>Per Year</th>
<th>Total Flight Time (hours)</th>
<th>Airborne Time Savings (hours)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
<th>ADOC + Fuel Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>40,979</td>
<td>803</td>
<td>650,302</td>
<td>$52,812</td>
<td>$610,764</td>
<td>$663,576</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>40,936</td>
<td>3,365</td>
<td>1,404,561</td>
<td>$176,283</td>
<td>$1,319,164</td>
<td>$1,495,447</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>40,575</td>
<td>24,998</td>
<td>3,399,275</td>
<td>$1,154,311</td>
<td>$3,192,599</td>
<td>$4,346,910</td>
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</tbody>
</table>
$ = FY16$; 
434 operations in 16 NextGen representative days (annualized to 9,901 operations per year); 
Fuel is $2.88$ per gallon

<table>
<thead>
<tr>
<th>Per Flight</th>
<th>Average Flight Time (hours)</th>
<th>Airborne Time Savings (min)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
<th>ADOC + Fuel Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>4.92</td>
<td>0.19</td>
<td>68</td>
<td>$4.79</td>
<td>$64.12</td>
<td>$68.91</td>
</tr>
<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>4.92</td>
<td>0.28</td>
<td>108</td>
<td>$7.31</td>
<td>$101.78</td>
<td>$109.09</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>4.83</td>
<td>5.49</td>
<td>521</td>
<td>$248.48</td>
<td>$488.90</td>
<td>$737.38</td>
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</table>

<table>
<thead>
<tr>
<th>Per Year</th>
<th>Total Flight Time (hours)</th>
<th>Airborne Time Savings (hours)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
<th>ADOC + Fuel Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>48,699</td>
<td>1,864</td>
<td>675,962</td>
<td>$47,436</td>
<td>$634,863</td>
<td>$682,299</td>
</tr>
<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>48,684</td>
<td>2,742</td>
<td>1,072,879</td>
<td>$72,389</td>
<td>$1,007,648</td>
<td>$1,080,036</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>47,823</td>
<td>54,380</td>
<td>5,153,795</td>
<td>$2,460,063</td>
<td>$4,840,445</td>
<td>$7,300,508</td>
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</table>
Atlantic Oceanic Results
New York Oceanic Airspace

US airlines tracks are in green
Atlantic Oceanic Region

<table>
<thead>
<tr>
<th>Per Flight</th>
<th>Average Flight Time (hours)</th>
<th>Airborne Time Savings (min)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
<th>ADOC + Fuel Savings ($)</th>
<th>PVT Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>6.16</td>
<td>0.09</td>
<td>58</td>
<td>$4</td>
<td>$54</td>
<td>$59</td>
<td>$11</td>
</tr>
<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>6.16</td>
<td>0.26</td>
<td>90</td>
<td>$11</td>
<td>$85</td>
<td>$95</td>
<td>$31</td>
</tr>
<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>6.13</td>
<td>1.94</td>
<td>241</td>
<td>$99</td>
<td>$226</td>
<td>$326</td>
<td>$293</td>
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</table>

<table>
<thead>
<tr>
<th>Per Year</th>
<th>Flights per Year</th>
<th>Airborne Time Savings (hours)</th>
<th>Fuel Savings (M kg)</th>
<th>Non-Fuel ADOC Savings (M $)</th>
<th>Fuel Savings (M $)</th>
<th>ADOC + Fuel Savings (M $)</th>
<th>PVT Savings (M $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>248,246</td>
<td>358</td>
<td>14.4</td>
<td>$1.03</td>
<td>$13.5</td>
<td>$14.5</td>
<td>$2.72</td>
</tr>
<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>248,246</td>
<td>1,085</td>
<td>22.3</td>
<td>$2.63</td>
<td>$21.0</td>
<td>$23.6</td>
<td>$7.61</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>248,246</td>
<td>8,045</td>
<td>59.8</td>
<td>$24.53</td>
<td>$56.2</td>
<td>$80.8</td>
<td>$72.82</td>
</tr>
</tbody>
</table>

$ = FY16$;
10,882 operations in 16 NextGen representative days in Atlantic Oceanic region (680.1 operations per day);
Fuel is $2.88 per gallon
Atlantic Oceanic Region

2020 Per Flight Fuel+ADOC Benefits ($)

- 15/15 FANS/ADS-B; 10 min HF: $59
- 15/15 FANS/ADS-B; 25/60 HF/ADS-B: $95
- 15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR: $326

2020 Annual Fuel+ADOC Benefits ($)

- 15/15 FANS/ADS-B; 10 min HF: $14,537,827
- 15/15 FANS/ADS-B; 25/60 HF/ADS-B: $23,616,254
- 15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR: $80,828,911
New York Oceanic Airspace Step Climbs in 16 Representative NextGen Days

**Step Climbs in WATRS**

- **Base**
  - 4,052

- 15/15 FANS/ADS-B; 10 min HF
  - 4,454
  - 9.9%

- 15/15 FANS/ADS-B; 25/60 HF/ADS-B
  - 4,761
  - 17.5%

**Step Climbs in KZWWY**

- **Base**
  - 8,331

- 15/15 FANS/ADS-B; 10 min HF
  - 8,755
  - 5.1%

- 15/15 FANS/ADS-B; 25/60 HF/ADS-B
  - 9,194
  - 10.4%
Pacific Airspace

US airlines tracks are in green
### Pacific Region

#### Per Flight

<table>
<thead>
<tr>
<th>Per Flight</th>
<th>Average Flight Time (hours)</th>
<th>Airborne Time Savings (min)</th>
<th>Fuel Savings (kg)</th>
<th>Non-Fuel ADOC Savings ($)</th>
<th>Fuel Savings ($)</th>
<th>ADOC + Fuel Savings ($)</th>
<th>PVT Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>8.23</td>
<td>0.15</td>
<td>68</td>
<td>$5</td>
<td>$64</td>
<td>$69</td>
<td>$17</td>
</tr>
<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>8.23</td>
<td>0.34</td>
<td>117</td>
<td>$17</td>
<td>$110</td>
<td>$127</td>
<td>$40</td>
</tr>
<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR</td>
<td>8.18</td>
<td>3.18</td>
<td>920</td>
<td>$134</td>
<td>$864</td>
<td>$999</td>
<td>$348</td>
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</table>

#### Per Year

<table>
<thead>
<tr>
<th>Per Year</th>
<th>Flights per Year</th>
<th>Airborne Time Savings (hours)</th>
<th>Fuel Savings (M kg)</th>
<th>Non-Fuel ADOC Savings (M $)</th>
<th>Fuel Savings (M $)</th>
<th>ADOC + Fuel Savings (M $)</th>
<th>PVT Savings (M $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15 FANS/ADS-B; 10 min HF</td>
<td>360,574</td>
<td>927</td>
<td>24.5</td>
<td>$1.80</td>
<td>$23.0</td>
<td>$24.8</td>
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<tr>
<td>15/15 FANS/ADS-B; 25/60 HF/ADS-B</td>
<td>360,574</td>
<td>2,063</td>
<td>42.4</td>
<td>$6.10</td>
<td>$39.8</td>
<td>$45.9</td>
<td>$14.41</td>
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<tr>
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<td>360,574</td>
<td>19,109</td>
<td>331.8</td>
<td>$48.43</td>
<td>$311.6</td>
<td>$360.1</td>
<td>$125.55</td>
</tr>
</tbody>
</table>

$ = FY16$; 15,806 operations in 16 NextGen representative days in Pacific region (988 operations per day); Fuel is $2.88 per gallon
2020 Per Flight Fuel+ADOC Benefits ($)

- $69: 15/15 FANS/ADS-B; 10 min HF
- $127: 15/15 FANS/ADS-B; 25/60 HF/ADS-B
- $999: 15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR

2020 Annual Fuel+ADOC Benefits ($)

- $24,767,020: 15/15 FANS/ADS-B; 10 min HF
- $45,878,606: 15/15 FANS/ADS-B; 25/60 HF/ADS-B
- $360,055,718: 15/15 FANS/ADS-B; 25/60 HF/ADS-B; UPR
Pacific Airspace Step Climbs in 16 Representative NextGen Days

Step Climbs in KZAK Eastcentral

- Base: 5,555
- 15/15 FANS/ADS-B; 10 min HF: 6,070 (9.3%)
- 15/15 FANS/ADS-B; 25/60 HF/ADS-B: 6,577 (18.4%)

Step Climbs in KZAK

- Base: 11,752
- 15/15 FANS/ADS-B; 10 min HF: 12,369 (5.3%)
- 15/15 FANS/ADS-B; 25/60 HF/ADS-B: 12,925 (10.0%)
Questions?

Thank you very much!
Modeling Overview

Region:

- Atlantic and Pacific regions
- US domestic surveilled airspace including Miami Oceanic (Caribbean) and San Juan (TJZS) uses 5 nm en route separation
- The region uses equipage dependent separation:
  - 10 minutes (80 nm) if an aircraft in a pair has HF communications
  - 50/50 for pairs of RNP10 ADS-C CPDLC aircraft
  - 30/30 for pairs of RNP4 ADS-C CPDLC aircraft
  - 15/15 for pairs of FANS/ADS-B equipped aircraft

Methodology

- Determine days for simulation (Used NextGen 16 representative days from 2015)
- 2015 schedules grown to model 2020 traffic levels
  - Atlantic 2020 Total Operations: 10,882
  - Pacific 2020 Total Operations: 15,806
- Gathered data on likely ADS-C RNP-4 CPDLC and FANS equipage for 2020
- Built model in RAMS Plus
- Document time and fuel burn results (Fuel burn, ADOC, and PVT values)
Foreign neighbors are assumed to participate in ROS in all test cases.

Aircraft cruising at or above FL320 initially assigned altitude of FL300 or FL310 depending on direction of flight. Step climbs attempted in all Oceanic Airspace once per 90 min (wide body aircraft) or per 150 min (narrow body aircraft). If denied, following up requests are made every 5 minutes.

Sectors feeding oceanic sectors use sector exit separations equal to oceanic scenario separations, or reduced separation if both aircraft have required equipage.

Canada and Portugal airspace assume 15/15 separation due to Data Link mandate.
A validated ATM fast-time simulation model applied worldwide to Model, Measure, and Quantify ATM system performance, procedures, and concepts.

Incorporates Enroute, Terminal Area, and Ground operations
Models European SESAR and FAA NextGen Operational Improvements
Commercially Available Product Since 1997

FAA, EUROCONTROL, NASA Langley, Lockheed, GE Aviation, GE GRC
ANSP: Spain AENA/INECO; Italy ENAV/SICTA; Portugal NAV Portugal; Sweden LFV; Bulgaria ATSA; Romania ROMATSA; Senegal ASECNA; Japan ENRI; Thailand AEROTHAI; China ATMB; Brasil DECEA/ITA; Colombia AEROCIVIL
Universities: London Imperial College; George Mason; Madrid UPM; University of York; Turkey Anadola; Barcelona UPC
Non-Monetized Benefits – Safety

Enhanced Situational Awareness

Enhanced global flight tracking

Enhanced Search and Rescue

Reduction in Pilot and ATC workload

Improved cross-flight information boundary error detection

Improved and earlier detection of off-track errors

Enhanced safety alerting

Improved weather avoidance

Enhanced Height Monitoring in RVSM airspace

Increased surveillance system augmentation and elimination of surveillance gaps

Enhanced safety for offshore helicopter operations

Enhanced incident and accident investigations

Source: Flight Safety Foundation
Wind Modeling

Wind days match FAA NextGen forecast days

- FAA forecast flight schedules are wind-friendly

NCEP/NCAR reanalysis wind data

- Per day, daily averages
  - Sensitivity analysis with stronger winds shows higher benefits
- 2.5 degree grid
- Upper altitude winds
  - 235 300 340 386 443
- Wind data is interpolated between altitudes

Higher fidelity flight times & fuel calculations
Route optimization was modeled assuming a wind-optimized route from the last filed navaid prior to entering oceanic airspace to the first filed navaid after exiting oceanic airspace.
Appendix E: Information References Related to ADS-B

Satellite-based air navigation has already been proven as a fiscally prudent, globally-accepted strategy to increase safety and efficiency.

The following is excerpted from the FAA NextGen website for domestic airspace:


“ADS-B is transforming all segments of aviation. Real-time precision, shared situational awareness, advanced applications for pilots and controllers alike – these are the hallmarks of ADS-B NextGen surveillance.”

“Real-time ADS-B is used now for air traffic control. General aviation is safer with ADS-B traffic, weather, and flight-information services. Safety and efficiency improve with advanced ADS-B applications.”

“ADS-B improves safety and efficiency in the air and on runways, reduces costs, and lessens harmful effects on the environment.”

FAA Aerospace Forecast; Fiscal Years 2016-2036, states: “Starting in 2017 the international market (comprised of mainline and regional carriers) should again start outpacing the domestic market in terms of enplanements, revenue passenger miles (RPMs) and available seat miles (ASMs) at an average annual rate (FY 2017-2036) of 3.6%, 3.5%, and 3.5% respectively.” The document states the strongest areas for growth for passenger carriers is the Caribbean and Atlantic, while cargo carrier activity will steadily increase in those areas, as well as significant growth throughout the Pacific.

Approved by the NextGen Advisory Committee June 2017

Goals and Priorities for Improving Operations in the Northeast Corridor Phase One

Report of the NextGen Advisory Committee in Response to a Tasking from The Federal Aviation Administration

June 2017
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Background/Introduction

In its February 22, 2017 meeting, the NextGen Advisory Committee (NAC) reached consensus to move forward with a tasking to focus on implementing NextGen in the Northeast Corridor (Washington, DC – Boston). During the Committee’s deliberations, members recognized that making continuous improvements to the system in the Northeast Corridor operationally benefits the entire US aviation system. They agreed that the work should start with defining what is included in implementing NextGen in the Northeast Corridor, highlighting the need for addressing the technical, operational and community issues that must be identified up front and then mitigated through the NAC collaborative process.

The FAA formally tasked the NAC in April 2017\(^1\) (Appendix C) to develop recommendations for the collective set of FAA, airport, operator and community initiatives that focus on implementing NextGen in the Northeast Corridor.

This report responds to Phase 1 of the task request which states:

\[\textit{Phase 1: By June 2017, define success in terms of benefits to include determining how benefits will be measured. Identify opportunities most likely to lead to success, and identify hurdles that could result in implementation challenges. The emphasis should be on opportunities that can be implemented in less than 18 months. Implementations of up to three years may also be considered.}\]

Given this request, the following report focuses on

1) Goals for Improving the Northeast Corridor
2) Metrics to Evaluate these Goals
3) Identification of Capability Objectives for the NEC
4) Prioritization of Capability Objectives through qualitative assessment of the impact of each capability on goals/metrics as well as the time required and risk for each option

Assumptions

The industry members from the NextGen Advisory Committee Subcommittee (NACSC) served as the Northeast Corridor (NEC) Task Group (TG) and identified the following Assumptions for the effort to impact the Northeast Corridor:

- The NEC includes the Washington, DC/Baltimore, Philadelphia, New York and Boston airports and associated airspace
- Time frames for NEC effort are <18 months, 18-36 months, 3+ years
- Adverse weather is a major issue in improving operations in the NEC

\(^1\) Tasking letter dated April 13, 2017 from Ms. Victoria Wassmer to Margaret Jenny, RTCA President.
• Factors for Success/Hurdles/Risk Factors
  o Assume financial support will materialize to move forward on prioritized initiatives
  o FAA Northeast corridor staffing key to success, daily operations and implementing new capabilities
    ▪ Unless sufficient staffing levels are achieved in the Controller work force, Traffic Management Units, Air Traffic Control System Command Center and supervisory workforce in facilities providing service in the Northeast corridor, the goals outlined in this document relative to implementation of technologies, procedures and processes will not be achievable.
  o Priorities for NEC may negatively impact timing of other initiatives
  o Equipage may determine desire to implement certain initiatives and ability to achieve benefits
  o Environmental issues/concerns are critical in reviewing capabilities

• Areas of Focus
  o Key driver of variation in operations is decision-making by different individuals (operator & air traffic), each with own experience and skill level
  o Scheduled operators are focused on schedule integrity and reduction of block times where opportunities exist
  o On-demand operators focused on flying time minimization

• Willingness to be key site for new capabilities

Guiding Principles

The Task Group identified the following Guiding Principles for the effort to improve performance in the Northeast Corridor:

• Capabilities should have an overall positive system-wide effect on NEC
  o Improving overall system performance may have some limited local negative impacts; these should be minimized
  o Capability discussion requires understanding of trade-offs – develop strategies to address

• Effort should establish quantitative “stretch” goal(s)
• Block times and called and actual rates should be the focus through this effort
• No new equipage mandates
• NEC is unique; hence capabilities in the NE Corridor may be unique
• Considerations in establishing priorities
  o Priorities should enable full utilization of available capacity in NEC, especially during peak demand periods and/or during irregular operations (IROPs)
- Buy-in from local communities and governments should be sought as soon as possible
- Effort should remain consistent with the overall NextGen’s TBO Vision and PBN NAS NAV Strategy
- Process needs to recognize “burn-in” (i.e., technical and non-technical issues associated with the introduction of new capabilities into the system) component to implementation; burn-in should be addressed and continually improved
- Priorities should be consistent with critical resource availability (technical, controllers, tech pilots, etc.)
- Important to evaluate the effects of improvements/enhancements at an airport/airspace area adjacent or in close proximity

Methodology

The development of the recommendation entailed several steps that provided the aviation community with opportunities to determine the goals for the recommended actions; metrics to evaluate the success of the actions; and the prioritization of the capability objectives to achieve the goals. This Phase One recommendation sets the stage for specific implementations that will be developed jointly between the FAA and the aviation community.

The following highlights the steps taken to develop this report.

February 22, 2017 Meeting of the NextGen Advisory Committee – initial discussion and subsequent request for feedback/input from NAC member organizations on the method to proceed, along with the goals and the metrics for NextGen capabilities that can improve operations in the Northeast Corridor.

March-June 2017 – The industry members of the NextGen Advisory Committee Subcommittee (NACSC) served as the Northeast Corridor (NEC) Task Group (TG) and received a series of briefings and engaged in discussions on current FAA and aviation industry initiatives in the NEC. The FAA provided experts that served as Subject Matter Experts (SMEs) for the Task Group.

As outlined in this report, the Task Group used a collaborative process to develop the following sections of the report:

- Goals-Metrics
- Assumptions and Guiding Principles
- Review of capabilities
- Consideration and review of previous (2013) prioritization effort – benefits, values and outcomes (excluded implementation readiness for this phase)
- Ranking of high-level list of capability objectives using a quantitative assessment and NAC-established prioritization criteria – vetted by Task Group
Goals for the Northeast Corridor

Tiers of Operational Benefit
There are three tiers of operational benefit for the Northeast Corridor:

**Tier 1: Improve execution of today’s operation in the NEC**
The first-tier focus is on improving today’s operation, namely improving predictability and reducing delay. Closing the gap between IFR and VFR rates may be a key aspect to maintaining schedule, reducing variability, improving predictability and completion factor. This includes reducing delay on the ground required to access the airspace. The first tier is focused on getting better at running the existing, full intended operation on time. For operators, the primary focus is on maintaining the revenue they already have and some cost reduction.

**Tier 2: Operate today’s flights more efficiently**
The second tier presumes success in the first tier. With a more reliable operation, the goal expands to include more efficient operations, namely improving upon the costs of time and fuel. This may include less vectoring, less tromboning, Optimal Profile Descents (OPDs) in the terminal area for arrivals, more optimal paths En route, etc. Step two is about minimizing the cost of operating the intended operation.

**Tier 3: Grow the capacity and schedule**
The third tier is focused on growth in the region. This step is about enhancing capacity, whether in the airspace or at the airport and links to growing revenue for operators.

Near-Term Goal
For the next 18 months, the goal for the Northeast corridor is to improve the traveler experience through better execution of today’s operation and adverse weather is a major issue in accomplishing this goal. This goal is applicable to any end traveler of the air traffic system, whether they be the traveling public, packages or business travelers. This goal is applicable to all weather conditions but the benefits accelerate when the weather deteriorates.

This goal can be further defined by three key sub-components:

- **Operate the full intended operation** – the traveling public’s first desire is that its flight is operated and not canceled
- **Operate on time** – assuming the flight is not cancelled, the traveler desires that his or her flight operate on time
- **Operate predictably** – finally, when there are extenuating circumstances, such as bad weather, the traveler desires to have predictability as to when and how their flight will operate, narrowing the uncertainty

The Tier 2 and Tier 3 goals identified above are applicable beyond 18 months. The longer term (beyond 18 months) may provide additional opportunities for aircraft equipage and ATC automation tools to deliver operational benefits.
Metrics that Define Success

Metrics that evaluate success against the goal of improving execution of today’s operation are presented below. These metrics were developed from the NextGen Advisory Committee’s set of approved metrics (See Appendix A). The metrics are defined relative to the three subcomponents of the goal:

<table>
<thead>
<tr>
<th>Near Term Goal</th>
<th>Associated Metrics</th>
<th>Definition / Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate the full intended operation</td>
<td>• Completion Factor</td>
<td>• Percent flights that operate from origin to destination as intended/scheduled</td>
</tr>
</tbody>
</table>
| Operate on time | • Departure Delay versus schedule  
• Arrival Delay versus schedule | • Percent flights that depart/arrive to gate at or before scheduled time² |
| Operate predictably | • Departure/Arrival delay versus schedule | • Total delay minutes |
| | • Actual Block Time  
  o Taxi Out  
  o En Route  
  o Taxi In | • 60th percentile and Standard Deviation  
• Actual times for city pair, arrival or departure airports |
| | • Called and Actual Throughput | • Mean/peak facility called rates and actual throughputs for airport/airspace |

Not all metrics will be applicable to all types of operators. Additionally, the metrics above are impacted by numerous operator actions, such as scheduling practices, aircraft types and equipage rates and frequencies. While performance of these measures is impacted by factors unrelated to NextGen implementations, NextGen implementations are expected to positively impact this set of metrics.

To effectively evaluate success of the stated goal through these metrics, a baseline of performance today is required. The Joint Analysis Team, which will ultimately evaluate the success of any implementations in the Northeast Corridor, is the appropriate entity to refine the approach to metrics and measure the baseline. Once a baseline is established, quantitative stretch goals should be defined for these metrics in the NEC.

² For non-scheduled FAR Part 91 and 135 operators, a “Call Ready to Push” is utilized as a proxy for scheduled departure time.
Controller Staffing and Resources
The assurance of sufficient staffing levels in the Controller work force, Traffic Management Units, Air Traffic Control System Command Center and supervisory workforce in facilities providing service in the Northeast corridor is a fundamental assumption in evaluating the prospects for successful achievement of the goals outlined in this document. It is important to understand the limitations imposed by understaffed facilities and how that condition factors into the prospects for success and timelines for any proposed initiatives. From a tactical standpoint, lack of staffing manifests itself in traffic flow management restrictions that negatively affect efficiency and capacity goals. From a strategic perspective, certain major facilities are critically understaffed. The number one priority is conducting on-the-job training for developmental employees. The time and resources for participating in design and development activities and training for new technologies, tools and procedures is limited. Achievement of sufficient staffing levels is an underlying thread that is pulled through each proposal in this response.

Capability Objectives to Improve NEC
The following are capability objectives for implementation and focus in the Northeast Corridor. These were generated from the capabilities identified by the 2013 prioritization recommendations and current FAA and aviation industry implementation initiatives. The sample Related Projects are designed to assist in understanding, but are not a comprehensive list. That list will be examined during Phase 2.
<table>
<thead>
<tr>
<th>Capability Objectives</th>
<th>Description</th>
<th>Sample Related Projects &amp; Programs</th>
</tr>
</thead>
</table>
| Deconflict Airports  | • Reduce or remove dependencies between New York airports that constrains 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:  
  • TermAirspace Resectorization  
  • 3 LGA RNAV Departures/ELSO  
  • 7110.308: BOS, EWR, PHL  
  • Capping and tunneling  
  • Use of IDAC & IDRP  
  • MIT passbacks  
  • CRDA at JFK, LGA  
  • ReCat at BOS/IAD  
  • EoR  
  • GLS  
  • EFVS |
| 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 | • TFMS  
  • Use of TBFM/RAPT/IDRP  
  • Departure Pre-Scheduling  
  • Utilize CTOP  
  • Improve EWR/PHL metering  
  • Surface data sharing  
  • DSP/PDRR |
| Improve Airspace Throughput | • Improve throughput through NEC airspace and en route airspace sectors  
  • May impact separation standards, rules, etc. | • 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 | • Surface/TFDM  
  • Implement TSAS  
  • FMS RTA/Airborne metering  
  • Expand use of IDAC  
  • ER DataComm/ABRR  
  • Consider Time-based Separation |
| Improve NAS Information, Common SA | • Enhanced information to aid in planning or decision making | • 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 | Procedure ideas:  
  • ROBER OPD to JFK  
  • Nighttime GLDMN  
  • Off-peak noise efficient nighttime alt  
  • DCA South SIDs  
  • PBN O/W app to LGA 22  
  • Offset app to EWR 22L |
Prioritization of Capability Objectives

The capability objectives above were prioritized through a survey of members of the Task Group. The survey asked members of the Task Group to identify which objectives are most important to achieving the goal of improving execution of today’s operation in the NEC. Respondents were asked a series of questions in which they had to rank order these seven options. Except for Implementation Readiness, the survey was structured to utilize the criteria and their relative weightings defined in the September 2013 NAC report “NextGen Prioritization” to assess the results.

Results from the survey are presented below. The Average Rank metric ranges from 1 to 7 with 7 representing the highest possible rank. The Percent in Top 3 metric presents the percent of all responses in which the capability objective was ranked as one of the top 3 capabilities out of the 7 options.

<table>
<thead>
<tr>
<th>Capability Objectives in Priority Order</th>
<th>Average Rank</th>
<th>Percent of Responses with Capability Ranked in Top 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Deconflict Airports</td>
<td>5.2</td>
<td>73%</td>
</tr>
<tr>
<td>2. Improve Individual Airport Throughput</td>
<td>4.8</td>
<td>58%</td>
</tr>
<tr>
<td>3. Improve and Integrate Existing Flow Management Capabilities</td>
<td>4.5</td>
<td>42%</td>
</tr>
<tr>
<td>4. Improve Airspace Throughput</td>
<td>4.1</td>
<td>47%</td>
</tr>
<tr>
<td>5. Implement New Flow Management Decision Support Tools</td>
<td>3.9</td>
<td>38%</td>
</tr>
<tr>
<td>6. Improve NAS Information, Common Situational Awareness</td>
<td>3.5</td>
<td>27%</td>
</tr>
<tr>
<td>7. Create New Noise Abatement Procedures</td>
<td>2.0</td>
<td>15%</td>
</tr>
</tbody>
</table>

The survey results indicated that the Task Group recommends that two capabilities – **Deconflict Airports** and **Improve Individual Airport Throughput** – should be given higher priority. As the Phase 2 NIWG group confronts decisions around project-level prioritization, these survey results should guide decision-making. These priorities are consistent with recommendations identified in Task Force 5.

These areas of focus should not disrupt activities that are already undergoing implementation and expected to be generally completed within 12 months. If there is ‘low hanging fruit’ of low effort, low risk projects that fall outside of these two focal areas, they should still be given due consideration in Phase 2. Likewise, during Phase 2 of this task, as specific projects are considered, implementation readiness will be an important factor in project-level prioritization.
Implementation Hurdles
As requested by the FAA Tasking letter, the Task Group identified the following hurdles that may result in implementation challenges (these are similar to those identified by Task Force 5 and the NAC 2013 Prioritization):

- Overarching: Controller staffing and resources (detailed above)
- Collaborative engagement between all ATC operational lines of business and operators in the airspace
- Collective ability or willingness to (de)prioritize specific projects or initiatives
- Collective ability to adjust existing plans and schedules
- Cultural issues – i.e. controller, pilots, dispatcher acceptance and implementation
- Environmental issues and concerns
- Funding
- Mixed equipage of aircraft/differing capabilities
- Operator staffing and resources
- Penetration of PBN equipage or 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
## Appendix A: NAC Approved Metrics

### NAC Approved 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 reported capacity rates *</td>
<td>Mean and peak capacity rates</td>
<td>• Facility Airport Arrival Rates (AAR) &amp; Arrival Departure Rate (ADR) Airlines (recommend: <a href="http://www.fly.faa.gov/voe/">http://www.fly.faa.gov/voe/</a>) however, the working group is open 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 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

Note: In course of detailed Joint Analysis Team evaluation of implementation, additional metrics may also be necessary for inclusion in the analysis.
## Appendix B: NACSC Members/NEC Task Group

<table>
<thead>
<tr>
<th>Aerospace Industries Association (AIA)</th>
<th>LeighFisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Line Pilots Association (ALPA)</td>
<td>Metron Aviation, Inc.</td>
</tr>
<tr>
<td>Airbus</td>
<td>Mosaic ATM, Inc.</td>
</tr>
<tr>
<td>Aircraft Owners and Pilots Association</td>
<td>National Air Traffic Controllers Association (NATCA)</td>
</tr>
<tr>
<td>Aireon, LLC</td>
<td>National Association of State Aviation Officials</td>
</tr>
<tr>
<td>Airline Dispatchers Federation</td>
<td>National Business Aviation Association</td>
</tr>
<tr>
<td>Airlines for America</td>
<td>NAV CANADA</td>
</tr>
<tr>
<td>Airports Council International (ACI North America)</td>
<td>NOISE (The National Association to Insure a Sound Controlled Environment)</td>
</tr>
<tr>
<td>Alaska Airlines</td>
<td>Northrop Grumman Corporation</td>
</tr>
<tr>
<td>American Airlines, Inc.</td>
<td>Port Authority of New York &amp; New Jersey</td>
</tr>
<tr>
<td>Atlas Air</td>
<td>Professional Aviation Safety Specialists</td>
</tr>
<tr>
<td>Cessna Aircraft Company</td>
<td>Project Management Enterprises Inc.</td>
</tr>
<tr>
<td>City of Houston, Texas</td>
<td>Raytheon</td>
</tr>
<tr>
<td>Dallas/Fort Worth International Airport</td>
<td>Regional Airline Association</td>
</tr>
<tr>
<td>Delta Air Lines, Inc.</td>
<td>Rockwell Collins, Inc.</td>
</tr>
<tr>
<td>DoD Policy Board on Federal Aviation</td>
<td>RTCA, Inc.</td>
</tr>
<tr>
<td>Elbit Systems</td>
<td>Saab Sensis Corporation</td>
</tr>
<tr>
<td>EUROCONTROL</td>
<td>Sandel Avionics, Inc.</td>
</tr>
<tr>
<td>FedEx Express</td>
<td>Sensurion Aerospace</td>
</tr>
<tr>
<td>Garmin Ltd.</td>
<td>SESAR Joint Undertaking</td>
</tr>
<tr>
<td>General Aviation Manufacturers Association</td>
<td>Southwest Airlines</td>
</tr>
<tr>
<td>Harris Corporation</td>
<td>Thales Group</td>
</tr>
<tr>
<td>Honeywell International, Inc.</td>
<td>The Boeing Company</td>
</tr>
<tr>
<td>International Air Transport Association</td>
<td>The MITRE Corporation</td>
</tr>
<tr>
<td>Jeppesen</td>
<td>U.S. Air Force</td>
</tr>
<tr>
<td>JetBlue Airways</td>
<td>United Airlines, Inc.</td>
</tr>
<tr>
<td>Jetcraft Avionics LLC</td>
<td>United Parcel Service (UPS)</td>
</tr>
<tr>
<td>L-3 Communications</td>
<td></td>
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<tr>
<td>Leidos</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C: FAA Tasking Letter
April 13, 2017

Ms. Margaret Jenny
President, RTCA, Inc.
1150 18th St. NW.
Washington, DC 20036

Dear Ms. Jenny:

The NextGen Advisory Committee (NAC) met on February 22, 2017, and agreed to make the Northeast Corridor (NE Corridor) a priority region in the Federal Aviation Administration’s (FAA) ongoing implementation of NextGen. The FAA supports the aviation industry’s recommendation to address improvements in the NE Corridor, defined for this task as the airspace from Washington, D.C., to Boston, including Philadelphia and New York City.

NAC member input received to date underscores the complexity of the NE Corridor in implementing and effectively utilizing NextGen capabilities. Success will require collaboration and consensus among many diverse and competing stakeholders. Consequently, we believe it is essential that stakeholders begin by working together to define what they view as the primary challenges and opportunities, as well as how success will be defined. Given the broader infrastructure program being contemplated by the administration, we would like the NAC to begin work immediately to inform the infrastructure program for improvements in the region.

We all recognize that NextGen requires significant investment from a variety of stakeholders, including the government, as well as those who manage airports and operate aircraft in the aviation system. Here is the question to be addressed by the NAC: What collective set of FAA, airport, operator and community initiatives can improve the NE Corridor?

The FAA requests that the NAC undertake the NE Corridor tasking in the phases outlined below.

- Phase 1: By June 2017, define success in terms of benefits to include determining how benefits will be measured. Identify opportunities that are most likely to lead to success, and identify hurdles that could result in implementation challenges. The emphasis should be on initiatives that can be implemented in less than 18 months. Implementations of up to three years may also be considered.

- Phase 2: By October 2017, use the deliverables in Phase 1 to define joint implementation commitments for the NE Corridor, including government and industry milestones, and
define how implementing those priorities would lead to measurable benefits. Subsequent to implementation, ensure benefits are measured.

The NE Corridor tasking should leverage the 2013 NextGen Prioritization criteria. As appropriate, the tasking should incorporate previous NAC recommendations to the fullest extent possible and leverage previous Tactical Operations Committee recommendations.

The FAA and other aviation stakeholders involved in implementing the NE Corridor initiative have limited resources. The NAC will need to include recommendations on which commitments and/or other existing priorities should be removed from current NextGen Priorities.

It is important to draw on what has worked well in the past and identify how to move forward. We look forward to the opportunity to share lessons learned at the upcoming NAC subcommittee meeting. If I can be of assistance, please contact me or James T. Eck, FAA Assistant Administrator for NextGen, at (202) 267-7111 or email James.Eck@faa.gov.

Sincerely,

Victoria B. Wassmer
Acting Deputy Administrator

cc: James T. Eck, Assistant Administrator, NextGen
Teri L. Bristol, Chief Operating Officer, Air Traffic Organization
Winsome Lenfert, Acting Associate Administrator, Airports
Jenny Solomon, Assistant Administrator for Policy, International Affairs, Environment and Energy
John Hickey, Deputy Associate Administrator, Aviation Safety