NextGen Advisory Committee (NAC)
October 31, 2018 Meeting Summary

The NextGen Advisory Committee (NAC) was held October 31, 2018 at The MITRE Corporation in McLean, VA. The meeting discussions are summarized below. Reference the attachments for additional contextual information.

List of attachments:

- Attachment 1: NAC Briefing
- Attachment 2: Attendance List
- Attachment 3: Public Statements
- Attachment 4: Approved *NextGen Integration Working Group Rolling Plan 2019-2021 Final Report*

Opening of Meeting / Introduction of NAC Members

Following administrative announcements, NAC Chairman Mr. Dave Bronczek, FedEx President and Chief Operating Officer (COO), opened the meeting and thanked Mr. Gregg Leonne, MITRE Vice President and Director, and MITRE for hosting the meeting. He then allowed NAC members/representatives around the table to introduce themselves (reference Attachment 2 for the complete attendance list). He added that future NAC meetings may return to a format with a longer agenda and dinner as has been done in the past.

Official Statement of Designated Federal Officer (DFO)

DFO Mr. Dan Elwell, Acting FAA Administrator, thanked Mr. Bronczek for his continued leadership as NAC chair. He echoed Mr. Bronczek's sentiments thanking Mr. Leonne and MITRE for hosting. Mr. Elwell presented the Federal Advisory Committee Act (FACA) notice that governs public meetings. He added that there is a robust agenda that includes discussion on various items such as approving the *NextGen Integration Working Group Rolling Plan 2019-2021 Final Report*, discussing new FAA taskings, and hearing from the Joint Analysis Team (JAT) and members of the public.

Chairman's Report

Mr. Bronczek then provided the Chairman's Report. To begin he called for a motion to certify the June 27, 2018 NAC meeting summary, which the NAC certified.

Outcome: NAC Members passed a motion to certify the June 27, 2018 NAC Meeting Summary.

Mr. Bronczek then announced Congress passing the FAA Reauthorization Act of 2018, which provides FAA authorization for the next five years. With its passing the FAA has the stability and resources to implement NextGen priorities. He continued that Mr. Craig Drew, Southwest Airlines Senior Vice President, would be discussing the implementation plan for the next three years and that it will be considered for NAC approval. With specific regard to the Northeast Corridor (NEC), he said that NextGen's success is not only technology implementation, but also utilizing the technology efficiently. He indicated that it has been two years since he challenged the NAC to take on the NEC and it continues to make progress, albeit slow. He added that the NAC will continue discussion on leveraging NextGen in the NEC to improve performance. He emphasized that the Northeast is not the only region the NAC focuses on, and that it will continue to focus on the entire country, led by the NEC.

He said that the NAC has highlighted key risks to NextGen in the NEC, which the NAC will continue to address. He highlighted that due to a combination of incentives, improved training, and hiring flexibility, controller staffing in New York, which the NAC identified as a key constraint to success, is improving. He indicated that he looks forward to Ms. Teri Bristol's, FAA Air Traffic Organization (ATO) Chief Operating Officer (COO), update on the topic and commended her team for the good work. The June NAC meeting focused on the community involvement and aircraft equipage risk areas, respectively. He said that community involvement is a key focus area of the FAA reauthorization, noting that there has been several key steps already taken. He emphasized that the aviation community must continue to have transparent engagement with impacted communities, adding that a Massport representative will be discussing its experience and perspectives from Boston area community engagement.

On the subject of aircraft equipage, Mr. Bronczek said that the challenges are significant and long-term. He mentioned that the reauthorization includes a pilot program that provides preferential treatment to aircraft with certain NextGen avionics, adding that industry is interested to hear how this consultation will take place. Mr. Bronczek then discussed ADS-B. He said that there are clearly differences in equipping general aviation fleets compared to commercial operators. He said Mr. Elwell will discuss the approach the FAA is taking with general aviation to work toward equipping. On the industry side, Mr. Bronczek said it will be equipped by January 1, 2020. He said that industry has made significant investments and commitments to meet this mandate and looks forward to hearing how the investment will pay off. He emphasized the importance of continuing to evaluate the impacts of NextGen implementations. Mr. Bronczek said that the JAT will provide some early NEC initiative feedback from its work to evaluate impacts.

In closing Mr. Bronczek said that the FAA Reauthorization Act of 2018 provides a unique opportunity to implement NextGen priorities. He indicated that the NAC will hear about the evolution of future NAC meetings and tasks, which focus on managing implementation risk.

He thanked participants for attending and said he looks forward to any comments. With no comments, he handed off to Mr. Elwell for the FAA Report.

FAA Report

Mr. Elwell said that the FAA remains fully committed to working with the NAC on NextGen implementation, adding that it values NAC contributions. He said that the FAA will continue to focus on delivery and implementation supporting the NEC and the NextGen Priority Focus Areas—Data Communications, Multiple Runway Operations, Performance Based Navigation, and Surface and Data Sharing.

He shared highlights of the FAA Reauthorization Act of 2018. Mr. Elwell said that while the bill did not include all legislative changes the FAA was seeking, it is happy Congress and the President passed a bipartisan, comprehensive bill that frees up the FAA from the uncertainty of short-term extensions and authorizes more reliable, predictable funding. Some specific elements of note included legislative changes to increase the safety and pace of unmanned aircraft systems (UAS) integration, as well as expediting the financing and development of capital airport projects. It also directs the FAA to advance leadership in international supersonic aircraft policies. Additional items include reforming the aircraft certification process, addressing aircraft noise, and ensuring safe lithium battery transport.

With specific regard to the NAC, the bill recognizes the NAC as an important engagement body between DOT/FAA and the aviation community. It specifically mentions the NAC in Section 503 Return on Investment. This calls for the FAA to work with the NAC on development of a priority list of NextGen programs. Other items in the legislation that would benefit from stakeholder input include:

- Sec. 547 Enhanced Air Services, which calls for the FAA to establish a pilot program to provide air traffic control services on a preferential basis to aircraft equipped with certain NextGen avionics.
- Sec. 502 Air Traffic Control Modernization Report, which calls for a report describing the multi-year effort of the Administration to modernize the air transportation system.

The bill calls on the FAA to examine dispersal headings for new PBN area navigation routes. There are also provisions for community involvement, noise mitigation studies, and aircraft noise exposure. There is also a call for the FAA to develop a report on how planned NextGen capabilities can enhance the resiliency and continuity of NAS operations and mitigate the impact of future air traffic control disruptions. Mr. Elwell indicated that the FAA is ready to get to work on the provisions and is evaluating the impact of the changes to law.

Mr. Elwell said that the FAA remains focused on ADS-B implementation and aircraft equipage for the 2020 mandate. He said that with only 14 months to go, the community must remain committed. He reported that equipage stands at roughly 50% in the airline community, with positive recent trends. Full fleet compliance will require an aggressive implementation schedule with little room for interruption. For general aviation, Mr. Elwell said that numbers are similar for frequent users of ADS-B rule airspace. For those that do not fly as often, the numbers stand around 25-30%.

He reported that on October 12, the FAA announced that is it reissuing the $500 ADS-B Out rebate program, which runs through October 11, 2019. He said the FAA is making $4.9 million available, which will fund nearly 9,800 ADS-B Out rebates. He then turned the floor to Ms. Bristol for an update on air traffic controller hiring, the NEC initiative, and Data Communications.

Ms. Bristol reported that for Fiscal Year 2018, the FAA exceeded its air traffic controller hiring target with 1,792 hires. She said that there are robust training initiatives underway in the New York area and they are seeing evidence that improved curriculum can reduce training time. With regard to 2019, Ms. Bristol indicated that the FAA expects to meet and exceed its hiring target of 1,431 with 17% already on board. She reported that the FAA has also been focusing on better planning to improve departure delays out of the New York region and, despite bad weather this year, delays are down 7.5% on average. She also noted that the FAA has received great Data Communications feedback and thanked everyone involved. Mr. Warren Christie, Vice President, Safety, Security and Fleet Operation, JetBlue Airways, commented that his airline did see improvements over the summer and expressed his thanks. Mr. Bronczek also echoed the sentiments, complimenting Ms. Bristol and her team.

Mr. Elwell continued with the FAA Report. He provided an update on the FAA's Terminal Flight Data Manager (TFDM) program, which he said is the surface management solution for NextGen. After providing an overview of the program, he emphasized that in order to achieve the surface metering benefits of TFDM, the FAA needs to have efficient data exchange with flight operators through System Wide Information Management (SWIM). He reported that the FAA has traveled to meet with industry operations and IT personnel to help them understand the benefits and what IT work is needed to complete. He said that TFDM will go operational at the first three sites—Charlotte, Phoenix, and San Francisco—beginning in 2021. He said the FAA needs industry to be ready to exchange data by that time.

Based on a June action item to reevaluate the work of the NextGen Integration Working Groups (NIWGs) and follow-up discussions with industry, the FAA is issuing two new taskings on the NEC initiative and the four NextGen priority areas. Integral to this alignment of FAA ground investments with airline investments, is work to advance the 2016 PBN NAS NAV strategy. In the next meeting, the plan is to focus on equipage in alignment with the PBN NAS NAV strategy. The overarching objective is to advance the NAC to look at the integration risks associated with the priorities in the rolling plan. He added that in line with discussions at the June NAC, the NAC working groups will become more self-sufficient. Working group chairs for these new taskings will need to take a more active role in managing the effort to respond to the NAC tasks. Based on a question regarding how the FAA plans to establish criteria for site selection for services in the reauthorization, Mr. Elwell called attention to the extensive nature of the bill and its required deliverables and indicated that the FAA continues to digest its contents. He thanked everyone for attending and indicated he looks forward to a productive meeting.

Oral Statements

Next, Mr. Bronczek invited the members of the public present to provide oral statements. He also said he had received two additional written statements that will be made available to the public. Please reference Attachment 3 for the full oral statement text and written statements.

The following citizens provided statements:

- Robert Holbrook, Palo Alto, CA (affiliated with Bay Area Jet Noise)
- Mark Shull, Palo Alto, CA

The following citizens provided written statements:

- Barbara Deckert, Elkridge, MD
- Anne Cowles, no location provided

Mr. Bronczek thanked both speakers for their time.

Subcommittee (SC) Co-Chairperson's Report: NextGen Priorities 3-Year Work Rolling Plan Task

Next, Mr. Drew recognized Ms. Melissa Rudinger, AOPA Vice President of Government Affairs, who is the other co-chair of the NAC Subcommittee (NAC SC). He said that the rolling plan recommendations included in the *NextGen Integration Working Group Rolling Plan 2019-2021 Final Report* were reviewed by the NAC SC earlier in October, with over 100 people involved. He provided highlights of each priority area included in the report, which the NAC will consider for approval.

Data Communications

- Past Success: Completed 55 tower service sites; added 7 more at industry request; JAT identified $54M saving for 2017
- Expand/Deliver Services: Implement initial service across all 20 en route control centers
- Resolve issues/improve capabilities: Address tech solutions to both air and ground shortfalls
- Increase participation: Establish equipage targets to increase fleet participation as well as develop Regional Jet equipage strategies

Multiple Runway Operations

- Past Success: MRO deployed Wake Recat at 31 airports saving an estimated $70M
- Reduce spacing and improve TRACON ops: Deploy New Consolidated Wake Turbulence standards at 17 locations that encompass numerous airports at each location

- Improve safety: Enhance wake turbulence collaboration and reporting
- Continue to improve procedures: Analyze/evolve parallel runways/Closely Spaced Parallel Ops to improve throughput

Performance Based Navigation

- Past Success: Joint road map: 2016 PBN NAS NAV Strategy
- Deliver efficiency improving tools: Deploy initial TBO to three initial locations in the NAS
- Continue savings/efficiency successes: Implement Metroplex at numerous additional locations
- Resolve procedural issues to improve throughput: Collaboration on Understanding / addressing barriers on Established on RNP implementation

Surface & Data Sharing

- Past Success: Operator capability to provide date elements to SWIM; NASA demonstration shows significant savings in fuel, surface delay and engine run time
- Foundational capability of traffic flow management: Emphasize collaboration/ data sharing between operators and FAA
- Saving time/fuel: Implement arrival/departure/surface metering thru Terminal Flight Data Manager capability across the NAS
- Capitalize on proven technology: Transfer of FAA/NASA demonstrated technical capabilities

Mr. Drew also reviewed some overarching considerations. He indicated that industry has identified some procedural capabilities that would be beneficial to improving efficiency in the NAS. He said the process has been long, but steady, and thanked the entire NIWG team for its work. Mr. Bronczek called for a motion to approve the recommendations in the *NextGen Integration Working Group Rolling Plan 2019-2021 Final Report*, which the NAC passed.

Outcome: NAC Members passed a motion to provide FAA with the NextGen Priorities 2019-2021 Rolling Plan recommendations

Northeast Corridor

Next, Mr. Bronczek introduced Mr. Flavio Leo (Massport), who provided a briefing on Massport's noise abatement program for Boston Logan International Airport. He began by providing an overview of Boston Logan's operational context, including that it has an urban setting, a limited footprint, a varied fleet mix, and weather challenges, among others. He reviewed some specifics of the noise abatement program Massport developed. This includes noise abatement departure procedures, late night runway preference, soundproofing programs for homes and schools, towing requirements for certain aircraft repositioning, etc. He explained that despite overall flights and noise output numbers being down, noise complaints and numbers of those complaining remains steady and has recently increased. He cited flight concentration as a result of RNAV implementation, the broad geographic reach, and social media use as likely contributors to the increase.

The FAA and Massport entered in to a memorandum of understanding (MOU) to study RNAV and noise with MIT as the technical lead team. Through the Massport Community Advisory Committee, there is extensive ongoing community engagement. Mr. Leo reviewed several graphic examples of proposed noise abatement procedures (reference the briefing in Attachment 1 for all images). On the subject of dispersion versus concentration (i.e., more people affected less versus fewer people affected more), Mr. Leo indicated that MIT is exploring different ways to address dispersion, but added that the conversation regarding preference needs to happen at the local level.

In closing, Mr. Leo reviewed several key takeaways. First, he said that noise abatement considerations need to be a factor in designing procedures from the start. He added that designers should use the precision of NextGen to achieve community benefits. In pursuing solutions, he emphasized that one has to be willing to accept some inefficiencies, such as achieving 90% of a goal to reduce impacts. Briefing and seeking input from community leaders and key organizations at critical milestones needs to start as early as possible. He also stressed the need to work together, adding that wins are important at the local level as hard work continues to ensure future growth and success.

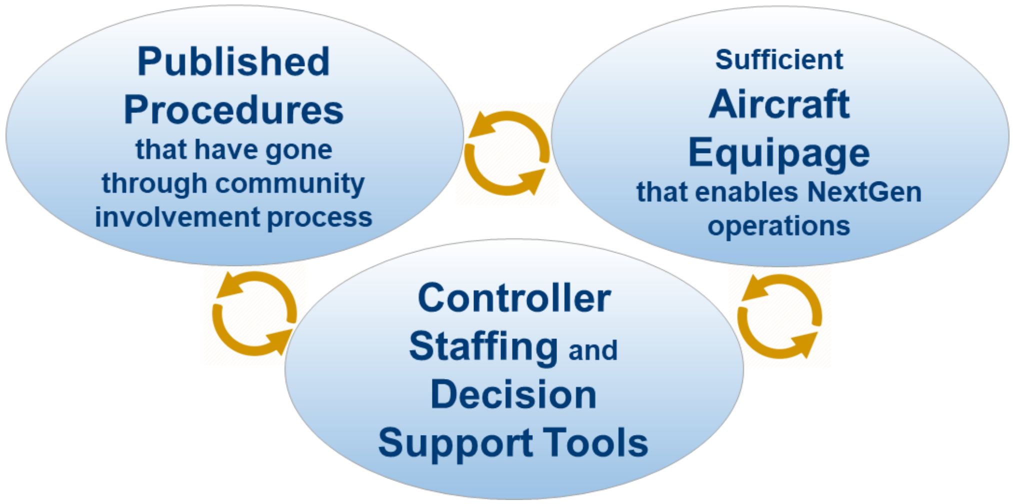
Mr. Brad Pierce, National Association to Insure a Sound Controlled Environment (N.O.I.S.E.) President, thanked Mr. Leo for presenting and setting an example for the rest of the country. Mr. Bronczek thanked Mr. Leo and introduced Mr. Steve Brown (National Business Aviation Association) and Mr. Mark Hopkins (Delta Air Lines), who briefed how these lessons learned are being considered in the NEC.

Northeast Corridor (NEC)

Mr. Brown reviewed the NEC NIWG's evolution from identifying goals and priorities for the NEC, to its current focus on risk reduction to support implementation goals. He said that risk identification and mitigation are necessary to pushing forward with successful implementation and ultimately delivering benefits. He indicated that the initial focus was on throughput, which includes improving outlook on the following risks:

- Community involvement – shared advocacy and partnership
- Equipage – synchronizing investments
- Staffing and tools – resources to support operational change

Now the focus is on tracking implementation of investments. He said that the reality is that everyone involved needs to make investments in a synchronized way. He referenced the following chart.



He said that published procedures are critical. Community involvement is a key risk. Operator equipage is a real challenge across the board, whether general aviation, military, commercial—all segments. He added that all involved need to think through how to get to critical mass so the controller community can maximize.

Mr. Brown also provided a community involvement update. He indicated that the overarching effort focuses on considering procedures and lessons learned from the past to develop best practices moving forward. He said that there are more technical subject matter experts involved in community involvement due to improved technical knowledge among those in the community. Keeping conversations technical-based enhances the ability to find a joint path forward. However, he emphasized that this operator involvement varies location to location and described efforts to develop a series of recommendations on how the private sector can be more involved. Mr. Brown indicated that he is satisfied with the community involvement work the group has done and looks forward to seeing FAA thoughts on the lessons learned.

Mr. Brown then handed off to Mr. Hopkins, who reviewed NEC NIWG aircraft equipage efforts. Based on regional jet equipage being identified as a risk to achieving the full benefits of PBN at the June 2018 NAC, the NAC asked the NEC NIWG to study a way to reduce risks based on regional aircraft equipage. Mr. Ron Renk (United Airlines) is leading this effort. Mr. Hopkins reviewed the initial findings of the activity. The group found that equipage is a problem with a scope larger than the NEC and common to more than only regional airlines. The proposed concept to help address the problem is developing a Minimum Capabilities List (MCL), which would be a list of minimum capabilities with plain language descriptions necessary to meet equipage levels. This would focus on forward fit aircraft, with a plan to focus on retrofits in parallel once the MCL is solidified. The team is currently working on what specifically should be included in the MCL, such as work to be done, SMEs that can weigh in on the conversation, and timeline information. The ROI for equipping is dependent on ground side capabilities. Operators are concerned about ROI for existing investments and FAA must be in lock-step so that money spent translates to money saved. Mr. Hopkins emphasized the need for a standalone tasking to focus on this effort.

During follow-on discussion, Mr. Bronczek posed whether it would be beneficial to have controllers involved in the process early due to a perceived gap between operator and controller expectations. Ms. Bristol indicated that this is a good approach and ATO will stay engaged as the group matures the concept. Mr. Christie expressed his support for the idea and recommended looking at incentivizing the entities using a "wait and see" approach.

Ms. Faye Malarkey-Black (RAA) asked what informed the risk element that regional airlines are the biggest risk. Mr. Brown explained that historical data showed that regional airlines are less equipped, but emphasized that the regional equipage-specific label will not be carried forward as the problem is wider than regional airlines only. Mr. Bronczek added that most mainline operators are equipped and that the issue needs to be solved with the regional airlines. Ms. Black said that factors include cost, but the main challenge is that with the differing ownership structures of regional aircraft, it is difficult to represent the full spectrum. She emphasized the need for more regional airline representation on the NAC. Mr. Brown indicated that the MCL group includes mainline and regional airline representation. Mr. Bronczek requested that an update on the MCL progress be included on the next NAC agenda. Mr. Brown recommended providing updates over the course of a year, in line with the effort's duration. Mr. Ed Zoiss, President, Electronic Systems, Harris Corporation, emphasized making sure the MCL approach weaves in DataComm progress expected in the first quarter of 2019.

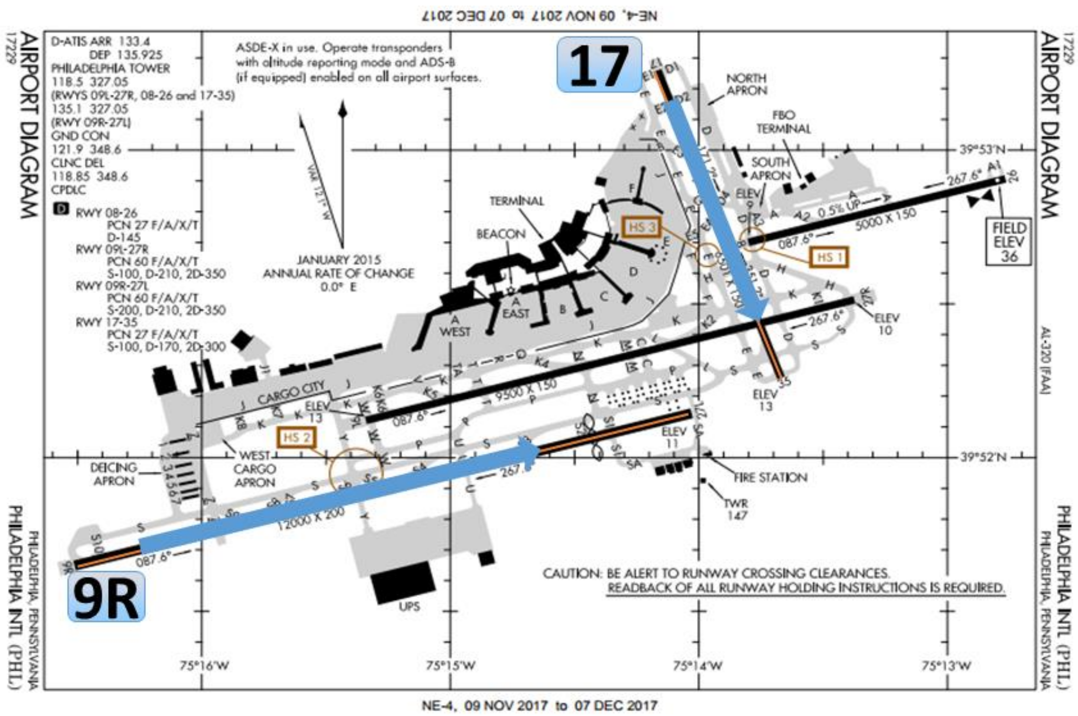
ACTION: The February 2019 NAC agenda will include an update on NEC Minimum Capability List (MCL) for Communications, Navigation, and Surveillance (CNS) recommendations.

Joint Analysis Team

Mr. Bronczek then introduced Mr. Alex Burnett and Mr. Dave Knorr who provided an overview of some positive findings of preliminary NEC implementation analysis for two NEC implementations.

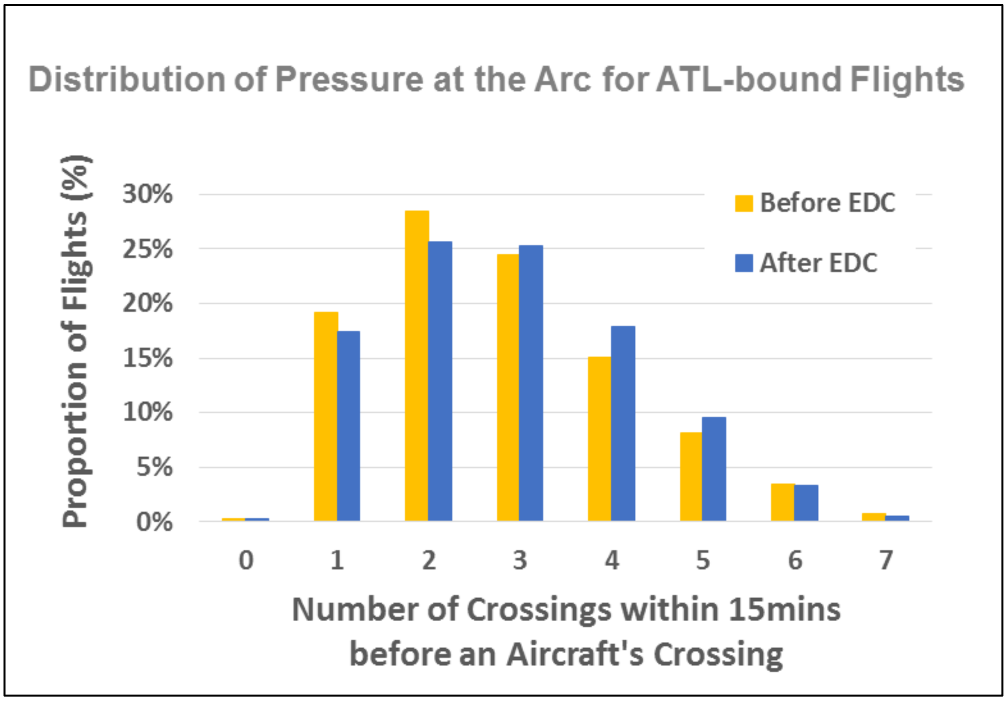
SCIA at PHL

- Allows aircraft to land on crossing runway in lower visibility
    - With ceiling between 421'-700' and visibility between 1 and 2 miles:
        - Before SCIA: one arrival runway (9R), arrival capacity = 32 per hour
        - After SCIA: two arrival runways (9R & 17), arrival capacity = 48 per hour



EnRoute Departure Capability (EDC)/Integrated Departure and Arrival Control (IDAC)

- Combination of EDC and IDAC supports better use of capacity at ZNY/ZDC border and improved merging of NY and PHL departures into overhead streams
    - Preliminary data analysis from JAT/Delta suggests some improvement in throughput at boundary in support of improved taxi-out times and A0 to ATL



Mr. Ralph Tamburro (Port Authority of New York and New Jersey) thanked the JAT for its work on the EDC/IDAC analysis, which he said clearly indicates the benefits.

Evolution of the NAC and New Taskings Discussion

Next, Mr. Bronczek asked Ms. Pam Whitley, FAA Acting Assistant Administrator for NextGen, to discuss the evolution of the NAC, as well as new FAA taskings. Ms. Whitley first acknowledged Ms. Pamela Gomez (FAA), who is transitioning within the FAA, for several years of NAC support. She introduced Mr. Greg Schwab (FAA), who is taking over the role. Ms. Whitley continued that the FAA envisions workgroup interactions to continue at the tactical level, as the four priority areas— Data Communications, Multiple Runway Operations, Performance Based Navigation, and Surface and Data Sharing —are at varying levels of maturity. The NAC SC will focus on risk assessment and making determinations on what merits NAC consideration. Additionally, it will focus on activities to mitigate risks or challenges. She described the NAC as the forum for primarily strategic discussions that drive outcomes. She also reviewed the two new NAC taskings:

- Northeast Corridor: Implementation Risks and Mitigations of the NextGen Priorities Joint Implementation Plan (ref 18-4)
- NextGen Priorities Four Focus Areas: Implementation Risks and Mitigations of the NextGen Priorities Joint Implementation Plan (ref 18-5)

Ms. Whitley indicated that the FAA is asking the NAC to assist with managing progress, identifying risks, and planning mitigations activities for the new taskings.

She indicated that the following task will remain open:

- Northeast Corridor: Joint Analysis Team (JAT) Assessment of Phase 1 Improvements (ref 18-1)

She indicated that the following task was closed with the NAC's approval of the *NextGen Integration Working Group Rolling Plan 2019-2021 Final Report*.

- Finalize 2019-2021 Joint Implementation Rolling Plan (ref 18-3)

Summary of Meeting and Action Item Review

Meeting Outcomes:

- NAC Members passed a motion to certify the June 27, 2018 meeting summary.
- NAC Members passed a motion to provide FAA with the NextGen Priorities 2019-2021 Rolling Plan recommendations
- NAC Members agreed to close all actions from the June 27, 2018 NAC

Meeting Actions:

Action ID	Action Description	Lead/Participant
NAC02-01	**The February 2019 NAC agenda will include an update on NEC Minimum Capability List (MCL) for Communications, Navigation, and Surveillance (CNS) recommendations.**	**FAA ANG**
NAC02-02	**The February 2019 NAC agenda will include an update on tasking 18-4: *Northeast Corridor: Implementation Risks and Mitigations of the NextGen Priorities Joint Implementation Plan.***	**FAA ANG**
NAC02-03	**The February 2019 NAC agenda will include an update on tasking 18-5: *NextGen Priorities Four Focus Areas: Implementation Risks and Mitigations of the NextGen Priorities Joint Implementation Plan.***	**FAA ANG**

Closing Comments and Adjourn

Mr. Bronczek adjourned the meeting.

Attachment 1

NAC Meeting

October 31, 2018

October 31 NAC Agenda

Time	Topic	Facilitator
8:30 – 8:35 AM	Opening of Meeting/Introduction of NAC Members	David Bronczek, FedEx Corp.
8:35 – 8:40 AM	Official Statement of Designated Federal Officer (DFO)	Dan Elwell, FAA
8:40 – 8:50 AM	Chairman's Report	David Bronczek, FedEx Corp.
8:50 – 9:05 AM	FAA Report	Dan Elwell, FAA
9:05 – 9:15 AM	Public Statements	Public
9:15 – 10:00 AM	Subcommittee (SC) Co-Chairman's Report NextGen Priorities 3-Year Rolling Plan Task [Recommendations For approval]	Craig Drew, SWA Melissa Rudinger, AOPA
10:00 – 10:30 AM	Northeast Corridor • Community Involvement – MASSPORT Lessons Learned	Flavio Leo, MassPort
10:30 – 11:15 AM	Northeast Corridor • Regional Airline Equipage Risk • Community Involvement Risks and Mitigations	Steve Brown, NBAA Mark Hopkins, Delta Air Lines
11:15 – 11:30 AM	Joint Analysis Team (JAT): "Highlighting Early Success" • Initial NEC Implementations – Preliminary Findings	Alex Burnett, United Airlines Dave Knorr, FAA
11:30 – 11:50 AM	Evolution of the NAC & New Taskings Discussion	Pam Whitley, FAA
11:50 – 11:55 AM	Summary of Meeting and Action Item Review	Greg Schwab, FAA
11:55 AM – 12:00 PM	Closing Comments and Adjourn	David Bronczek, FedEx Corp.

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Opening of Meeting and Introduction of NAC Members

David Bronczek, FedEx Corp.

PUBLIC MEETING ANNOUNCEMENT
Read by: Designated Federal Officer Dan Elwell
NextGen Advisory Committee
October 31, 2018

This meeting is being held pursuant to a notice published in the Federal Register on October 15, 2018. The agenda for the meeting will be as announced in that notice, with details as set out in the agenda handed out today. I am the designated FAA official responsible for compliance with the Federal Advisory Committee Act, under which the meeting is conducted. It is my responsibility to see to it that the agenda is adhered to and that accurate minutes are kept. I also have the responsibility to adjourn the meeting should I find it necessary to do so in the public interest.

The meeting is open to the public, and members of the public may address the NAC with the permission of the Chair. The Chair may entertain public comment if, in his judgment, doing so will not disrupt the orderly progress of the meeting and will not be unfair to any other person. Members of the public are welcome to present written material to the committee at any time.

Chairman's Report

David Bronczek, FedEx Corp.

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FAA Report

Dan Elwell, FAA

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Public Statements

Members of the Public

NextGen Priorities 2019-2021 Rolling Plans Recommendations

Craig Drew, NAC Subcommittee Co-Chair, Southwest Airlines
Melissa Rudinger, NAC Subcommittee Co-Chair, AOPA

NIWG Rolling Plan 2019-2021
Final Report Recommendation

Data Comm

- **Past Success:** Completed 55 tower service sites; added 7 more at industry request; JAT identified $54M saving for 2017
- Expand/Deliver Services: Implement initial service across all 20 en route control centers
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NIWG Rolling Plan 2019-2021
Final Report Recommendation

Multiple Runway Operations

- **Past Success:** MRO deployed Wake Recat at 31 airports saving an estimated $70M
- Reduce spacing and improve TRACON ops: Deploy New Consolidated Wake Turbulence standards at 17 locations that encompass numerous airports at each location
- Improve safety: Enhance wake turbulence collaboration and reporting
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Performance Based Navigation

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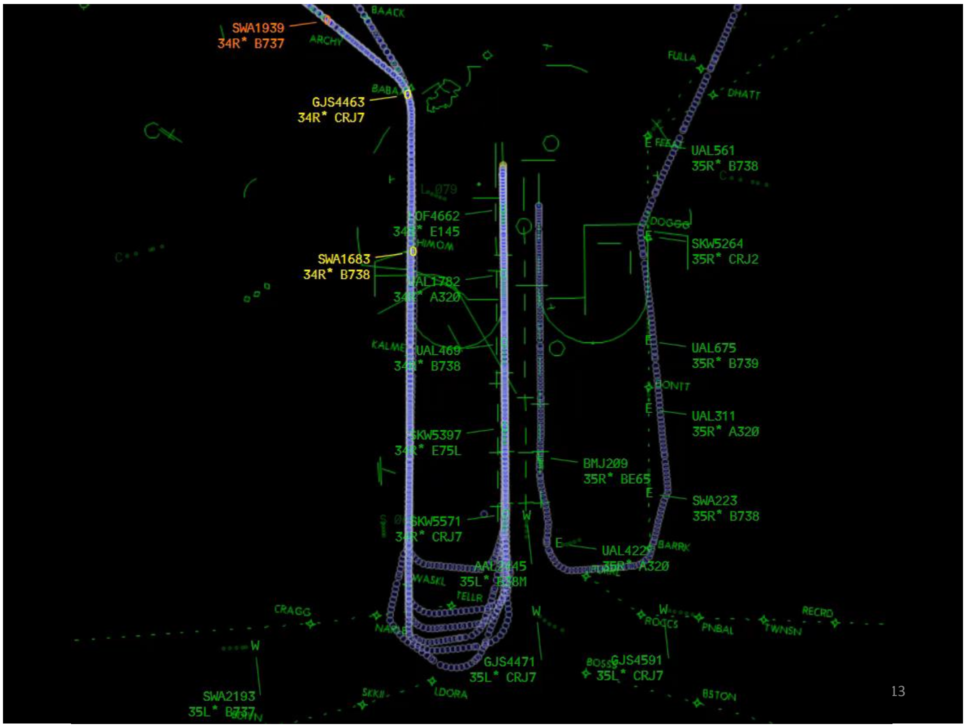
NIWG Rolling Plan 2019-2021
Final Report Recommendation

Performance Based Navigation

Denver 34R/35R Video
Simultaneous Independent IAP's
with Established on RNP (EoR)
Oct 10, 2018 operations

- 34nm(34R) & 27nm(35R) savings versus Vectors to ILS



NIWG Rolling Plan 2019-2021
Final Report Recommendation

Surface & Data Sharing

- **Past Success:** Operator capability to provide date elements to SWIM; NASA demonstration shows significant savings in fuel, surface delay and engine run time
- Foundational capability of traffic flow management: Emphasize collaboration/ data sharing between operators and FAA
- Saving time/fuel: Implement arrival/departure/surface metering thru Terminal Flight Data Manager capability across the NAS
- Capitalize on proven technology: Transfer of FAA/NASA demonstrated technical capabilities

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NIWG Rolling Plan 2019-2021
Final Report Recommendation

Considerations

- Success of commitments is dependent on establishing capital funding, stabilized funding, and roadmaps to fund procedures and technology
- Analysis of additional advanced procedural capabilities that may provide efficiencies and increased operational capabilities
- Continued collaboration to align ground technologies, aircraft technologies, and procedures
- Measure/report benefits, savings, and successes of the capability of program milestones

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Northeast Corridor: Community Involvement

Flavio Leo, MassPort

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Boston Logan International Airport Context, RNAV Implementation, and Community Challenges

Briefing to:

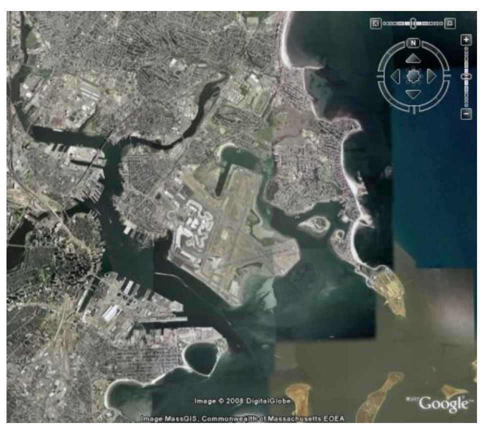
NextGen Advisory Committee (NAC)

October 31, 2018

Flavio Leo
Massachusetts Port Authority

Boston Logan Operational Context

- Urban Setting
- Limited footprint
- Busy international and domestic O&D market
- Varied fleet mix
- Weather challenges
- Growing
- Engaged community, long history of addressing impacts



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Massport has developed a comprehensive noise abatement program for Logan Airport

- Noise abatement departure procedures
- Late night runway preference, opposite direction operations
- Decibel restriction on R4L departures and 22R arrivals
- Unidirectional/wind restriction use R14/32
- Soundproofing Program for Homes and Schools
- Engine run-up restrictions
  - Limited time
  - Specific locations
- Towing requirements for certain aircraft repositioning
- Encourage use of single engine taxiing and reverse thrust
- 24/7 noise complaint line 617-561-3333
- State of the art Noise Monitoring System
- Near live flight tracking on website
  - http://www.massport.com/environment/environmental_reporting/Noise%20Abatement/overview.aspx

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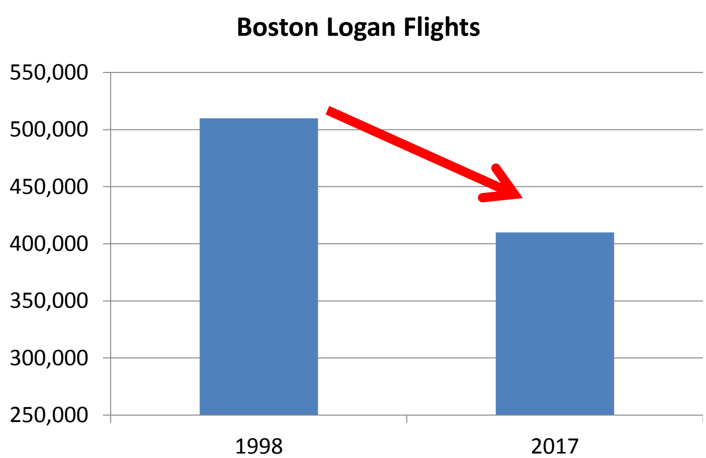
Although flights fluctuate year to year, over the long term Logan Airport is serving more passengers on fewer flights



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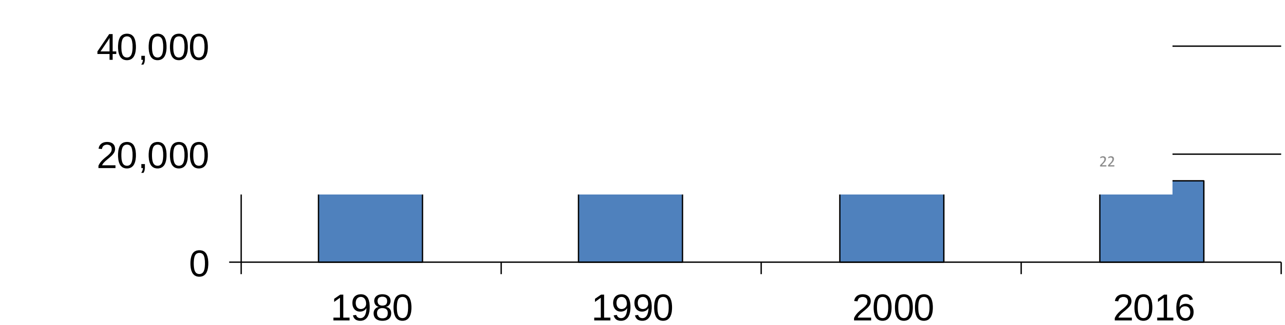
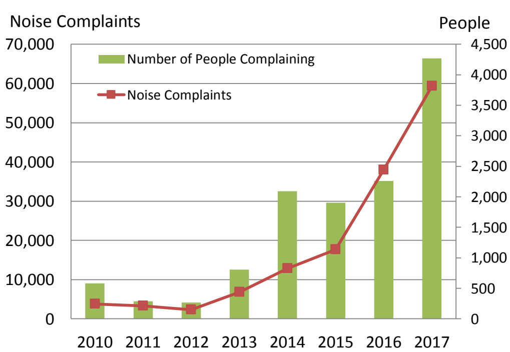
Reflecting new engine technology and a reduction of total flights, Logan's noise contours have shrunk significantly

Note: 65db DNL is FAA's designation of significant noise exposure

Total Population, 65 dB DNL- Boston Logan

Although overall flights and noise are down, public concerns over noise remains and has recently increased…





- RNAV flight concentration
- Broad geographic reach, over 90 communities, well outside 65DNL
- Increased use of social-media

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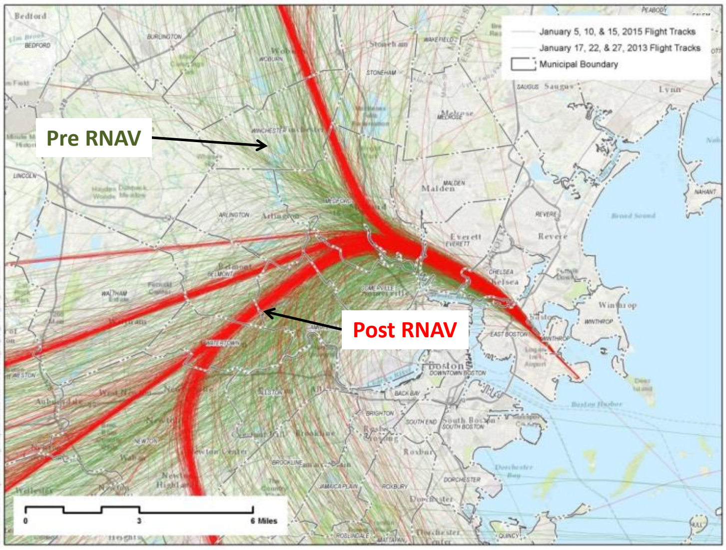
An outcome of RNAV is a concentration of flights…

Example- Departures - Runway R33L



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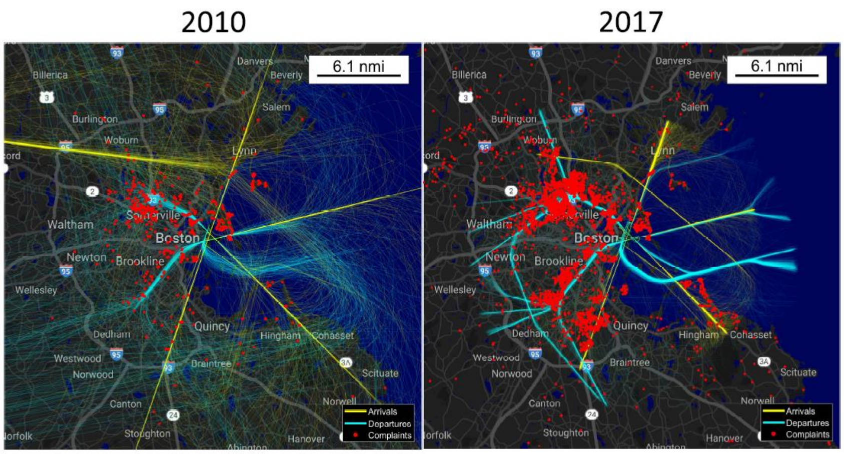
RNAV Track Concentration and Complaints



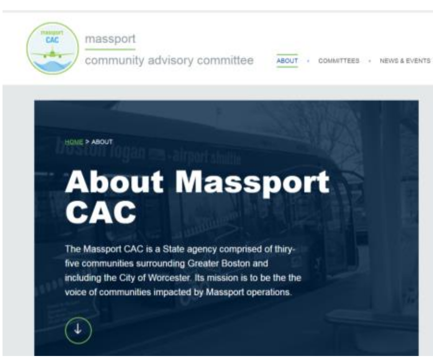
Source: MIT, Massport

24

The FAA and Massport entered into an MOU to study RNAV and noise with MIT as the lead technical team

- MIT (jointly funded by FAA and Massport through ASCENT research program)
  - Massport is providing in-kind matching resources
  - Massport has sponsored one graduate student
  - Massport is a member of Advisory Committee
- Consultant Services Funded by Massport
  - HMMH
  - Joe Davies, ex-FAA manager

MCAC List of Communities and Members



Source: MassportCAC.org

Community	Member
Arlington	Frank Ciano
Bedford	Heidi Porter
Belmont	Myron Kassaraba
Beverly	TBD
Boston (East Boston)	John Nucci
Boston (Fenway)	Maura Zlody
Boston (Hyde Park)	Irene Walczak
Boston (Roslindale)	Alan Wright
Boston (Roxbury)	Joanne Keith
Boston (South Boston)	David Manning
Braintree	Sandra Kunz
Brookline	Heather Hamilton
Cambridge	Bill Deignan
Canton	Laura Smead
Chelsea	Roseann Bongiovanni
Cohasset	Ralph Dormitzer
Concord	Pam Hill
Everett	Tony Sousa
Hingham	Katie McBrine
Hull	David Carlon
Lexington	Michelle Ciccolo
Lincoln	Jennifer Burney
Lynn	William Bochnak
Malden	Christopher Webb
Marblehead	Charles Gessner
Medford	Peter Houk
Melrose	Peter Navarra
Milton	Cindy Christiansen
Nahant	Robert D'Amico
Quincy	Frank Tramontozzi
Randolph	John McVeigh
Revere	Frederick Sannella
Salem	William Legault
Scituate	Gary Banks
Somerville	Wig Zamore
Swampscott	Richard Malagrifa
Watertown	Andrea Adams
Weymouth	TBD
Winthrop	Jerry Falbo
Worcester	Jacob Sanders

Extensive Community Engagement with Massport CAC (and public) at important milestones

- October 7th Announcement with FAA, elected officials, MCAC (2016)
- Massport Press Release
- Briefing to CAC Executive Committee (10/24/16)
- Briefing to CAC Aviation Committee (11/2/16)
- Massport briefing to Executive Committee (11/29/16)
- Briefing to full Massport CAC (12/08/16)
- Briefing to Massport Executive Committee (2/14/17)
- Public Meeting (2/22/17)
- Massport CAC Aviation Subcommittee Briefing (05/05/17)
- Massport CAC Aviation Subcommittee Briefing (09/28/17)
- Briefing Update to full Massport CAC (10/12/17)
- State House elected representatives (11/13/17)
- Massport CAC Aviation Subcommittee (11/14/17)
- 2nd Public Meeting (11/15/17)
- Massport CAC voted to support Block 1 (12/7/17)
- MIT Brief to MCAC on Block 2 Technical Approach and Ideas (4/18/18)
- Massport provided update on RNAV Study to MCAC (6/14/18)
- Massport/MIT/FAA Update to brief MCAC (10/18/18)

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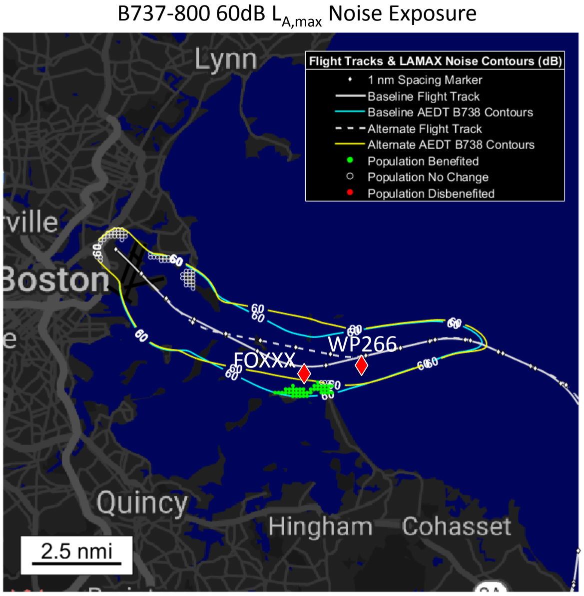
Example, Runway 15R SID modification

B737-800 60dB $L_{A,max}$ Noise Exposure



B737-800
Population Exposure ($L_{A,MAX}$)

	60dB
Current RNAV	5,838
.41 RNAV	4,815
Current RNAV – .41 RNAV	1,023

Source: MIT

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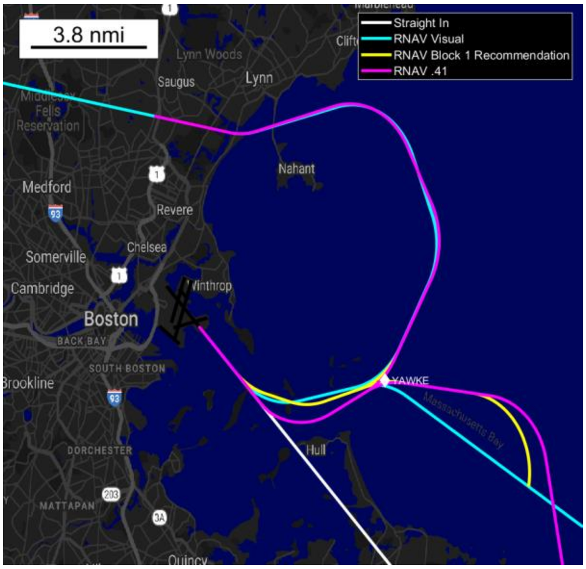
Example, R33L arrival RNAV options…



RNAV Visual

- Cannot be designed as an RNAV procedure due to 56° final turn angle

RNAV Block 1 Recommendation

- Operators did not support this procedure due to short final leg length

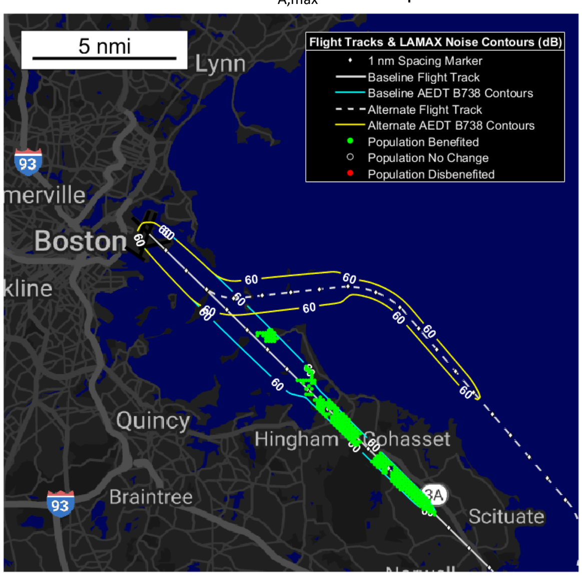
RNAV .41

- Identified as JDv5
- Was thought to be the preferred option on 24 Aug 2018
- "Garnered the most favor with the operators present during the .41 meeting"

Source: MIT

…R33L, RNP approach

B737-800 60dB $L_{A,max}$ Noise Exposure



	60dB
Straight In	2,954
RNP	0
Difference (Straight In–RNP)	2,954

1-A1b: RNAV Visual procedure is already available as a "Special" procedure

Source: MIT

Example, R22R departures- more challenging

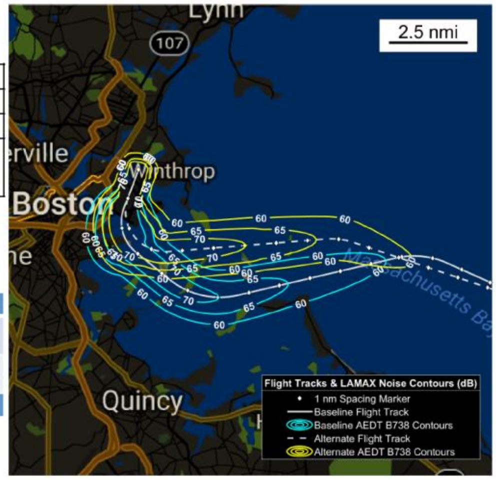
MIT ICAT

Option C - Heading-based departure (1-D3c): Noise Impact

Aircraft	B737-800
Metric	$L_{A,MAX}$
Noise Model	AEDT
Notes	Vertical departure profile derived from median or historical radar data

Population Exposure (L_{MAX})

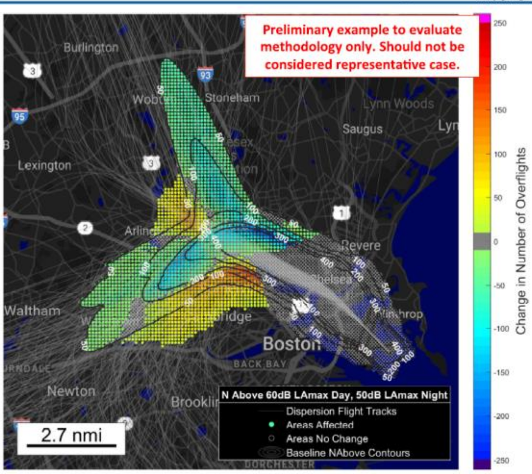
	60dB	65dB	70dB
Baseline RNAV SID	17,630	4,541	549
Modified Procedure	9,668	851	0
Reduction	7,962	3,690	549



Dispersion versus concentration, Example R33L Departures

MIT ICAT

33L Departures Controller-Based Dispersion Change in N_{Above}



Analysis based on peak day operations; only includes 33L departures

Population Exposure

N Above	50x
Baseline	336,643
Dispersion	356,960
Baseline - Dispersion	-20,317

Change In N Above	Population
+200x	290
+100x	20,566
+50x	77,428
-50x	65,338
-100x	19,167
-200x	1,844

N_{Above} Thresholds:
60dB $L_{A,max}$ Day, 50dB $L_{A,max}$ Night

In Summary…

- Industry has been successful over the long-haul in reducing impacts
- At Logan, local FAA has been engaged with community on noise
- Rollout of PBN/RNAV has resulted in increased complaints/engagement

Key Takeaways

- Design procedures with noise abatement considerations from the start
- Use the precision of NextGen to achieve community benefits
- Shoot for win/win but be willing to accept some inefficiencies (e.g., achieve 90% of the goal to reduce impacts)
- Brief/seek input community leaders and key organizations at critical milestones and starting as early as possible
- Evaluate legacy limitations to allow for greater flexibility (without impacting safety/efficiency)
- Industry, FAA-Airlines-Airports, need additional “wins” to ensure future growth/success (e.g., wake vortex generators, phase-out of older a/c like MD80s, procedure designs incorporating reduced noise)

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Northeast Corridor:

Regional Airline Equipage Risk

Community Involvement Risks and Mitigations

Steve Brown, NBAA

Mark Hopkins, Delta Air Lines

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Evolution of the NEC NIWG

June 2017 – identified goals and priorities for the NEC
- Improve execution
- Increase efficiency
- Accommodate growth

October 2017 – identified near-term opportunities
- Leveraged existing efforts
- Adjusted plans to support NEC

March 2018 – identified priority need areas to focus longer term efforts
- Deconfliction and departure efficiency are top priorities
- iTBO for NEC introduced

June 2018 – established a plan for NEC through December 2021
- Many pre-implementation commitments

October 2018 – initiated risk evaluation and mitigation
- Focus on risk reduction to support implementation and meet goals

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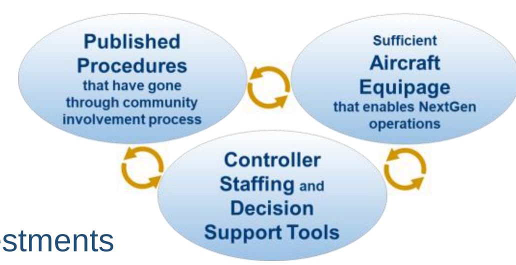
Risk Management for NEC

- Risk identification and mitigation are necessary to push toward with *successful implementation* and ultimately to *deliver benefits*
- Risks include:
  - Community involvement – shared advocacy and partnership
  - Equipage – synchronizing investments
  - Staffing and tools – resources to support operational change



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Community Involvement

- Community involvement requires FAA, Aircraft Operators and Airport Operators to work collaboratively and cooperatively*
- Realities
  - Diversity of community interests across NEC
  - Degree of sponsorship from Airport Operators
  - Range of advocacy from Aircraft Operators
- Opportunities
  - Strengthening FAA strategy for NEC CI
  - Joint presentations to Roundtables, etc.
  - Lessons learned from successful actions

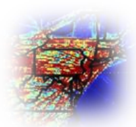
* From Government/Industry Blueprint for Community Outreach and FAA Community Involvement Manual

Aircraft Equipage

- NAC was briefed at June meeting on risks to achieving benefits with Northeast Corridor project
- One of the biggest risks presented is the lack of regional jet equipage to participate in NextGen PBN procedures
- Lack of equipage is delaying benefits of PBN across the NAS as noted in PBN NIWG final report. We are not realizing full benefits with mixed equipage.
- NAC asks NEC NIWG to study a way to reduce risks based on lack of regional aircraft equipage and Ron Renk (UAL) asked to lead activity.
- Equipage is a suite of Comm/Nav/Surveillance

Initial Findings/Recommendations
(given first meetings of Equipage Activity)

- Equipage is a problem outside of just regional airlines and outside of just Northeast Corridor. Recommend NAC consideration of stand alone tasking to ensure we look at this problem for the NAS and for all operators.
- Looking at retrofits has complications. Fastest way to get moving the right direction is to look at a "Minimum Capabilities List" (MCL) for forward fit aircraft. Once MCL solidified we can look at retrofit as a way to accelerate benefits.
- More plain language review describing the MCL items and expected ROI. Is needed for NAC and decision-makers
- The ROI for equipping is dependent on ground side capabilities. Operators are concerned about ROI for existing investments and FAA must be in lock-step so that money spent translates to money saved.
- Messaging of MCL needs to be shared within Operators (fleet purchasing), and OEMs need to buy-in to have capabilities available.



Summary

- The objective of the NEC efforts is *implementation* to achieve benefits aligned with NEC goals identified in June 2017
- NEC will continue to work collaboratively:
  - Actively identify, evaluate, and mitigate risks that challenge the NEC Joint Implementation Plan
  - Ensure pre-implementation commitments are executed and lead to implementation commitments
  - Ensure implementation commitments are completed and assess achievements against goals
- Equipage activity/workgroup will continue to work MCL, ROI and plain language messaging

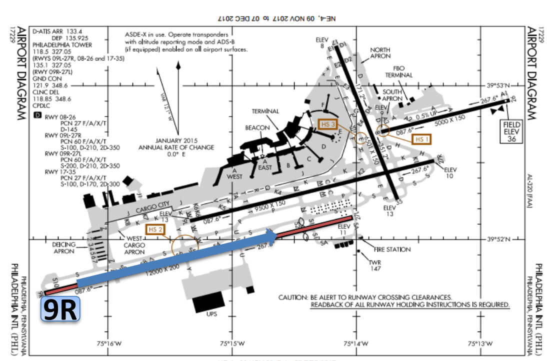
Joint Analysis Team (JAT): "Highlighting Early Success"

Initial NEC Implementations – Preliminary Findings

Alex Burnett, United Airlines
Dave Knorr, FAA

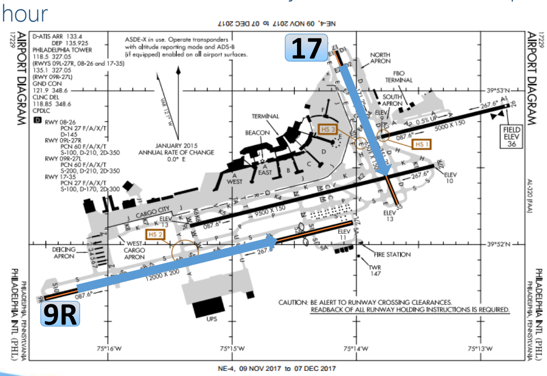
SCIA at PHL

- Simultaneous Converging Instrument Approaches (SCIA)
- Allows aircraft to land on crossing runway in lower visibility
  - With ceiling between 421'-700' and visibility between 1 and 2 miles:
    - Before SCIA: one arrival runway (9R), arrival capacity = 32 per hour



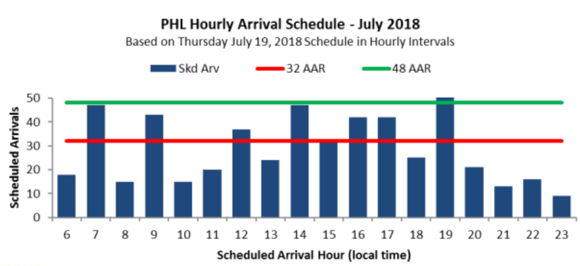
SCIA at PHL

- Simultaneous Converging Instrument Approaches (SCIA)
- Allows aircraft to land on crossing runway in lower visibility
  - With ceiling between 421'-700' and visibility between 1 and 2 miles:
    - Before SCIA: one arrival runway (9R), arrival capacity = 32 per hour
    - After SCIA: two arrival runways (9R & 17), arrival capacity = 48 per hour



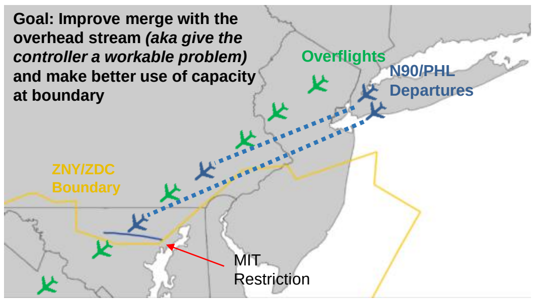
SCIA at PHL – Preliminary Findings

- SCIA for Runways 9R/17 implemented on July 19, 2018
  - American Airlines highlights two recent days in September where the new procedure helped alleviate Ground Delays and keep flights on schedule….
  - *ASPM data indicates 20 to 40 QTR hours where SCIA appears to have been applied in September 2018*



EDC/IDAC

- En Route Departure Capability (EDC)
- Integrated Departure and Arrival Control (IDAC)
- Combination of EDC and IDAC supports better use of capacity at ZNY/ZDC border and improved merging of NY and PHL departures into overhead streams



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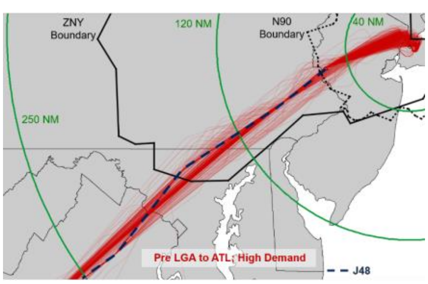
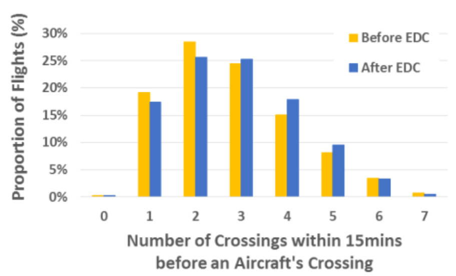
EDC/IDAC Preliminary Findings

- *Preliminary data analysis from JAT/Delta suggests some improvement in throughput at boundary in support of improved taxi-out times and A0 to ATL*

Example of Pre-EDC/IDAC Operations



Distribution of Pressure at the Arc for ATL-bound Flights



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Evolution of the NAC & New Taskings Discussion

Pam Whitley, FAA

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NextGen Advisory Committee (NAC)
Path Forward

The FAA, through the NAC, seeks consensus advice with industry in alignment with the Federal Advisory Committee Act.

FAA NextGEN

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NAC Taskings

New NAC Taskings

- Northeast Corridor: Implementation Risks and Mitigations of the NextGen Priorities Joint Implementation Plan (ref 18-4)
- NextGen Priorities Four Focus Areas: Implementation Risks and Mitigations of the NextGen Priorities Joint Implementation Plan (ref 18-5)

Open NAC Taskings

- Northeast Corridor: Joint Analysis Team (JAT) Assessment of Phase 1 Improvements (ref 18-1)
- Finalize 2019-2021 Joint Implementation Rolling Plan (ref 18-3)

Complete

- Northeast Corridor: Finalize Phase 2 Recommendations (ref 18-2)

Future

- Northeast Corridor: Equipage for Communications, Navigation, and Surveillance (pending)

FAA NextGEN

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Summary of Meeting and Action Item Review

Greg Schwab, FAA

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NAC Actions
June 27, 2018

Action ID	Action Description	Lead/Participant
NAC01-01	Ms. Bristol will send Mr. Bronczek surface data sharing status (on airlines providing 11 data elements) and request of airlines for additional surface data required for terminal publication in order to realize TFDM benefits.	FAA ATO, AVS
NAC01-02	Mr. Elwell will provide the NAC with an update during its next meeting on the ADS-B Out GA Equipage Incentive Program.	FAA ATO, AVS, ANG, APL, AGC, AFN
NAC01-03	Mr. Bronczek requested an agenda item for the next meeting that includes a disposition of all existing work groups, then a decision on what needs to continue at that time.	FAA ANG
NAC01-04	Mr. Bronczek requested that community involvement be on the agenda at their next Airlines for America Board meeting.	A4A
NAC01-05	Due to the importance of community involvement to the success of the NEC, it will be an agenda topic for the next NAC meeting.	FAA AOC, ATO, ANG, AEA
NAC01-06	Mr. Elwell requested Chip Childs continue to work on this NEC equipage risk item; to work with regional partners and mainline operators; and continue this as an agenda topic for the next meeting.	NAC SC

NAC Actions
October 31, 2018

2019 NAC Engagements

- February 13: 1:00 – 4:00 PM
- June 11: 8:00 AM – 12:00 PM
- September 17: 1:00 – 4:00 PM

Closing Comments and Adjourn

David Bronczek, FedEx Corp.

Joint Analysis Team (JAT)

BACKUP SLIDES

Joint Analysis Team (JAT)

An FAA / industry collaboration mechanism established to reach a common statement of fact regarding NAS performance attributed to the implementation of NextGen capabilities

- Focused on measuring performance impacts in key metrics
  - Throughput
  - Block time, including variability
  - Taxi-out time
  - Arrival performance (A0)
  - Fuel burn
  - Gate departure delay
  - *Completion Factor**

Additional metrics and normalization applied as appropriate

* **Note**: Additional metric added by NEC

Joint Analysis Team (JAT)

- Previous JAT analysis / taskings
  - Multiple Runway Operations (RECAT at 5 sites)
  - Performance Based Navigation
    - NTEX Metroplex
    - EOR at Denver
    - OPD's at BOS and GYY
  - Data Communications (Tower)

Current Task:

Evaluate the operational benefits of the 8 Northeast Corridor (NEC) Phase 1 (T+18) initiatives

NEC T+18 Implementations

	Initiative	Initial Ops Availability	Supporting Org.	Study Periods*	Benefits Assessment*
1	**Implement EDC at ZNY**	**Q1 2018**	**FAA MITRE AA, DL, UA, JB**	**Feb-Aug 2017 vs. Feb-Aug 2018**	**Preliminary: Oct 2018 Initial: Feb 2019 Final: Apr 2019**
2	**Implement TBFM IDAC at 4 NY Towers**	**Q1 2018**			
3	Implement BOS SWIM Visualization Tool at ZBW	Q2 2018			
4	**Implement SCIA to PHL 9R/17**	**Q3/Q4 2018**	**FAA MITRE AA**	**Jan -Jun 2018 vs. Jan -Jun 2019**	**Preliminary: Apr 2019 Initial: Oct 2019 Final: Jan 2020**
5	Implement CRDA DCIA application for PHL 27R/35 for RNAV approaches	Q1 2019	FAA MITRE AA		
6	Improve airborne metering to PHL**	Q1 2019	FAA MITRE AA	Apr -Oct 2018 vs. Apr -Oct 2019	Preliminary: Oct 2019 Initial: Feb 2020 Final: Apr 2020
7	Expand consistent usage of defined and existing capping and tunneling for departures/arrivals to/from the NEC through required advisories	Q1 2019	TBD		
8	Implement TBFM Pre-Departure Scheduling at selected airport	Q1 2019	TBD		

Note: 1 & 2 will be studied together

* May need to be adjusted based on the actual initial ops availability date and data availability; analysis of baseline performance will be conducted and reported on prior to the preliminary reporting

** May need to compare 2017 to 2019 study periods to eliminate periods with inconsistent use of metering

JAT Next Steps

- Complete analysis of post operational data and quantify the value of EDAC/IDAC and SCIA
  - Update NAC at future meeting
- Continue collection and analysis of Pre-implementation data for other NEC implementations

Attachment 2

NextGen Advisory Committee (NAC)
October 31, 2018 Attendance List

Last Name	First Name	Affiliation	NAC Member
Allen	Dan	FedEx Corporation	
Allen	Mark	Federal Aviation Administration	
Attarian	Howard	United Airlines, Inc.	NAC Member
Balloff	David	Federal Aviation Administration	
Barry	James T.	PASSUR Aerospace	
Batchelor	David	SESAR Joint Undertaking	
Bechdolt	Anne	FedEx Corporation	
Bertapelle	Joe	JetBlue Airways	
Bolen	Ed	National Business Aviation Association	NAC Member
Bowman	Jim	FedEx Corporation	
Bristol	Teri	Federal Aviation Administration	NAC Member (non-voting)
Bronczek	David	FedEx Corporation	Chair
Brown	Lee	Landrum & Brown	
Brown	Steve	National Business Aviation Association	
Burnett	Alex	United Airlines, Inc.	
Butler	Steven	Federal Aviation Administration	
Canoll	Tim	Air Line Pilots Association	NAC Member
Carey	Bill	Aviation Week	
Cebula	Andy	RTCA, Inc.	
Challan	Peter	Harris Corporation	
Christie	Warren	JetBlue Airways	NAC Member
Cochran	Walter	Leidos	
Collings	Chris	Harris Corporation	
Cook	Charles	JetBlue Airways	
Creasap	Donna	Federal Aviation Administration	
Cunha	Jason	Federal Aviation Administration	
Dalton	Rick	Southwest Airlines	
Davis	Melvin	Cavan Solutions	
Drew	Craig	Southwest Airlines	NAC Member
Duffy	Kent	Federal Aviation Administration	
Dumont	Pete	Air Traffic Control Association	NAC Member

Last Name	First Name	Affiliation	NAC Member
Duncan	John	Federal Aviation Administration	NAC Member (non-voting)
Elwell	Dan	Federal Aviation Administration	DFO
Evans	Ginger	Tower Consulting	
Fanning	Eric	Aerospace Industries Association	NAC Member
Fontaine	Paul	Federal Aviation Administration	
Glenn-Chase	Abigail	Air Traffic Control Association	
Gomez	Pamela	Federal Aviation Administration	
Graham	Jim	Delta Air Lines, Inc.	
Hamel	Christophe	L3 Technologies	
Hanlon	Daniel	Raytheon	
Heise	Angela	Leidos	NAC Member
Hennig	Jens Christian	General Aviation Manufacturers Association	
Hill	Fran	Leidos	
Hodges	Scheid	Department of Defense	
Holbrook	Robert	Mountainview, CA Resident	
Hopkins	Mark	Delta Air Lines, Inc.	
Huffman	Mike	Federal Aviation Administration	
Johnson	Sasha	United Airlines, Inc.	
Joly	Pascal	Airbus	
Kenagy	Randy	Air Line Pilots Association	
Knorr	Dave	Federal Aviation Administration	
Kohut	Anne	Airport Noise Report	
Lall	Vivek	Lockheed Martin	NAC Member
Lee	Flavio	Massport	
Lee	Marlene	Federal Aviation Administration	
Leone	Gregg	MITRE Corporation	NAC Member (non-voting)
Maffei	John	Federal Aviation Administration	
Malarkey Black	Faye	Regional Airline Association	
Martin	Glen	Federal Aviation Administration	
McArtor	Allan	Airbus	NAC Member
McGraw	Paul	Airlines for America	
McLean	Donna	Donna McLean Associates	
Merritt	Jon	United Airlines, Inc.	
Moloney	John	The Boeing Company	
Narvid	Juan	Federal Aviation Administration	
Newman	Emily	FedEx Corporation	
Novia	Robert	Federal Aviation Administration	
O'Keefe	Rush	FedEx Corporation	
Parker	Edward	Federal Aviation Administration	

Last Name	First Name	Affiliation	NAC Member
Pearce	Bob	National Aeronautics and Space Administration	
Pennington	Darrell	Air Line Pilots Association	
Peyton	Bret	Alaska Airlines	
Pierce	Brad	National Association to Insure a Sound Controlled Environment (NOISE)	NAC Member
Rinaldi	Paul	National Air Traffic Controllers Association	NAC Member
Rudinger	Melissa	Aircraft Owners and Pilots Association	
Sawyer	Dennis	The MITRE Corporation	
Schwab	Greg	Federal Aviation Administration	
Scruggs	John	FedEx Corporation	
Shull	Mark	Palo Alto, CA Resident	
Silver	David	Aerospace Industries Association	
Sinnett	Michael	The Boeing Company	NAC Member
Slutsky	Max	United Airlines, Inc.	
Smiley	Dan	PASSUR Aerospace	
Sunderman	Jennifer	Regional Airline Association	
Steinbicker	Mark	Federal Aviation Administration	
Stewart	Chuck	United Airlines, Inc.	
Stone	Kimball	American Airlines, Inc.	NAC Member
Swayze	Richard	Delta Air Lines	
Takemoto	Paul	Federal Aviation Administration	
Tamburro	Ralph	Port Authority of New York & New Jersey	
Terry	Rich	Delta Air Lines	
Thoma	Don	Aireon	
Tranter	Emily	National Association to Insure a Sound Controlled Environment	
Tree	Jon	The Boeing Company	
Ullmann	Jim	National Air Traffic Controllers Association	
Verrett	Mario	Department of Defense	
Whitley	Pam	Federal Aviation Administration	NAC Member (non-voting)
Woods	Jeff	National Air Traffic Controllers Association	
Wongsangpaiboon	Natee	Federal Aviation Administration	
Wright	Janelle	Montgomery County Quiet Skies Coalition	

Attachment 3

Oral Statement 1:

Robert Holbrook, Palo Alto, CA
(affiliated with Bay Area Jet Noise)

In 2005, I moved back to Silicon Valley from Seattle. Airplane noise was my top concern and I bought a house with little noise. But in recent years, the FAA has taken almost ALL the airplanes bound for San Jose Airport, hundreds of jets a day that previously were spread across a two-mile wide corridor east of me, placed them on a tight rail and then moved that rail over my house. In doing this, the FAA broke faith with decades of homebuyers like me making the biggest financial decisions of our lives.

I've spent two years looking for solutions. I have many ideas, but today please consider a suggestion that would address noise impacts due to flight concentration. Activism will increase as concentration increases. Concentration will increase with precision navigation as well as with new technologies like Time Based Flow Management, which, I fear, might double arrivals over areas near me that are already reeling from NextGen.

My vision is for FINE-GRAINED DISPERSION using precision navigation. Horizontally, fine-grained dispersion would allow planes to be spread evenly across areas they historically overflew while still avoiding wake turbulence. Vertically, fine-grained dispersion would enable planes to descend on glide paths natural to them - more efficiently and with less noise.

I believe this vision is achievable and widely acceptable, and that it would be best for the NAC to reverse the trend toward concentration by calling now for new technology to enable flights to be safely and efficiently dispersed as they were historically.

Thank you.

Oral Statement 2:

Mark Shull, Palo Alto, CA

Hello. My name is Mark Shull. I live in Palo Alto California.

I'm here to ask the FAA to better support San Francisco Airport's GBAS or GLS initiative. Specifically, RNP to GLS has the ability to reverse some of the damage caused by NextGen's concentrating low altitude, high energy approaches along a narrow corridor over Stanford and Palo Alto. Overall operations at SFO have increased by only about 10% since the year 2000. Yet, traffic over Stanford and Palo Alto has grown from 70 flights a day in 2000, to almost 400 a day today.

Today, three procedures merge over Palo Alto and Stanford. To add to this, San Jose is regularly in Southflow, so it is common for two SFO planes to cross with minimal vertical separation – even heavys and supers – to approach both SFO runways simultaneously, at the same time San Jose is turning in the opposite direction just below the SFO planes.

If there is any place that GBAS is warranted, it is in the extremely crowed San Francisco Bay Area metroplex. Not just at SFO, but at San Jose and Oakland as well.

But here is the problem. The FAA, presumably NorCal Tracon, has informed SFO that any RNP to GLS approach procedures that SFO creates, must not require or include any changes to STAR or other arrival procedures. In other words, while SFO wants to use RNP to GLS to reduce noise over the Peninsula, the FAA is only willing to implement pure overlays of today's procedures. Early AEDT modeling actually shows that implementing GBAS will increase, not decrease, noise on a per flight basis because of this problem.

This is very frustrating to the local community, and so I am here to ask that the FAA and the NAC set policies to require the FAA to make changes to arrival procedures where possible in order for GBAS initiatives, such as SFO's, to take advantage of GBAS's capability to not only improve safety and efficiency, but also to reduce noise over populations. Specifically, we are asking the FAA to design ways for the SERFR, PIRAT and BEDGA structures to take advantage of SFO's GBAS initiative to reduce noise over the heart of Silicon Valley.

Thank you.

policies be implemented at the FAA to work more collaboratively with airport and airline GBAS initiatives, such as at SFO, to use this technology not just for brute force efficiency, but also to reduce noise exposure over people, as was always envisioned for NextGen.

Written Statement 1:

Barbara Deckert, Elkridge, MD

From: Barbara Deckert <bdcouture@aol.com>
Sent: Sunday, October 21, 2018 4:09 PM
To: Butler, Steven CTR (FAA) <Steven.CTR.Butler@faa.gov>
Subject: Re: BWI Noise Complaints: Documentation of Dissent

Dear Mr. Butler:

Thank you for your response.

Please do forward my email to the NAC Chairman; if you would be so kind as to provide his or her email address to me, I will add it to my mailing list. I thought I was emailing gregory.schwab@faa.gov.

My purpose in emailing Mr. Schwab and every other FAA email address that I can collect is to bring to your attention the dissatisfaction with NextGen that those of us who have the misfortune of living near your flight paths experience, to the tune of over 1,000 noise complaints submitted to BWI per day. Prior to NextGen, BWI received at most about 300 noise complaints per year. I rather doubt I could recite the details of the past three years of noise bombs in a two minute testimony, were I to attend the NAC meeting.

I have lived in my home in Elkridge, MD, about three miles from BWI, for the past 34 years; it has only been since the full implementation of NextGen in September of 2015 that noise from the airport has been a problem. Now, I cannot open a window for fresh air or work in my yard without the continuous, harassing, thunderous boom of aircraft, at up to 107 dB as documented by the MAA. If I leave my house to shop at Costco, about eight miles away, walking through the parking lot into the store is like being under an air show. If I visit my daughter and her family in Columbia, about 20 miles away, the planes are just as loud there as they are at my house. My entire, heavily-populated and affluent county is noise bombed because of FAA policies.

I have attended all the BWI Roundtable meetings for the past year and a half. I have witnessed the FAA's obtuseness, obstructiveness, and disingenuousness and the Roundtable's frustrations in their attempts to negotiate a technical solution for the noise pollution that now plagues us. As of April, the very minor flight path changes offered by the PBN Working Group, and which were then withdrawn because Maryland has petitioned for an environmental review, in my opinion would not bring any significant improvement. The FAA refused to address arrivals, half the problem, and refused to discuss altitudes, one root of the noise problem. The other root, dispersion of flight paths, seems to be an incomprehensible concept to the FAA. That's all we want: dispersion and higher altitudes.

At two recent Roundtable meetings, a physician testified that she was worried about cancer clusters from exposure to particulate pollution associated with these flight paths in the not too distant future. A behaviorist described the noise bombs as an *intermittent punishmen*t, similar to that used by torturers; he was unable to work in his own home and care for his autistic son because of the noise cause by FAA policies. For me, the noise has stolen my ordinary enjoyment of the use of my home. I am worried about the well-documented health affects of aircraft noise exposure and the reduction of property values, as documented by FAA-sponsored studies at up to 18%, which for my modestly valued home represents a loss of about $80,000 for me, and eventually for my children who will inherit my estate.

Just this morning I re-read the NextGen sections of the FAA Modernization and Reform Act of 2012. There is nothing in the bill that says that these flight paths need to be concentrated for 20 or more miles from the airport. There is nothing that says that they need to be at low altitudes for that distance. That is FAA policy, which is not of Congresses doing.

So, until you folks decide to fix the noise problem, I will continue to mail a copy of my noise complaints to all and sundry at the FAA.

Sincerely,

Barbara Deckert
6075 Claire Drive
Elkridge, MD 21075

-----Original Message-----
From: Steven.CTR.Butler <Steven.CTR.Butler@faa.gov>
To: bdcouture <bdcouture@aol.com>
Cc: gregory.schwab <gregory.schwab@faa.gov>
Sent: Fri, Oct 19, 2018 9:40 am
Subject: RE: BWI Noise Complaints: Documentation of Dissent

Dear Ms. Deckert,

Thank you for your email. I am a bit unclear on whether you are requesting to speak at the October 31 NextGen Advisory Committee (NAC) meeting. If so, I have provided the instructions below. If not, we are happy to pass along your email to the NAC chairman.

In order for the chairman to consider and approve any public request for oral statements, we request that you provide a written statement in advance.

Additionally, if the statement pertains to the topics of the meeting and is approved, there will be a time limit of two minutes in order to accommodate other speakers and a full agenda. We would also like to point out that while the committee welcomes your comments, public statements are not open for discussion. Your comments will be acknowledged as part of the record for consideration.

Please provide me your written statement no later than October 24 to allow the NAC Chairman time to evaluate the request.

Regards,

Contractor Support

From: Barbara Deckert <bdcouture@aol.com>
Sent: Monday, October 15, 2018 1:27 PM
To: Schwab, Gregory (FAA) <gregory.schwab@faa.gov>
Subject: Fwd: BWI Noise Complaints: Documentation of Dissent

Barbara Deckert

Begin forwarded message:

> **From:** Barbara Deckert <bdcouture@aol.com>
> **Date:** October 15, 2018 at 9:35:12 AM EDT
> **To:** oag@oag.state.md.us, jweinstein@howardcountymd.gov, akittleman@howardcountymd.gov, eric.ebersole@house.state.md.us, clarence.lam@house.state.md.us, terri.hill@house.state.md.us, edward.kasemeyer@senate.state.md.us, ltaylor@howardcountymd.gov, assistance@vanhollen.senate.gov, brent_girard@vanhollen.senate.gov, Treasurer@treasurer.state.md.us, mdcomptroller@comp.state.md.us, maanoiseabatement@mdot.state.md.us, mdotcustomerservice@mdot.state.md.us, rsmith4@bwiairport.com, 9-awa-noiseombudsman@faa.gov, david.richardson@wnco.com, newstips@baltimoresun.com, salterman@cargoair.org, James.DeGrange@senate.state.md.us, guy.guzzone@senate.state.md.us, Edward.Reilly@senate.state.md.us, bryan.simonaire@senate.state.md.us, gail.bates@senate.state.md.us, shirley.nathan.pulliam@senate.state.md.us, john.astle@senate.state.md.us, scott.r.proudfoot@faa.gov, critpbn@natca.net, Marie.Kennington-Gardiner@faa.gov, Steven.w.lewis@faa.gov, Robert.A.Owens@faa.gov, Jodi.mccarthy@faa.gov, pat.daly@aacounty.org, dklee@howardcountymd.gov, nsurosky@baltimorecountymd.gov, Ellen20794@gmail.com, kbassarab@bwiairport.com
> **Subject: BWI Noise Complaints: Documentation of Dissent**
>
> Ladies and Gentlemen:
>
> We citizens living in the communities around BWI cannot rely on the unprofessional and unethical MAA to accurately tally and report noise complaint numbers to you, so here is a weekly digest of my noise complaints filed through airnoise.io.
>
> I have also included a screen shot showing totals that have been submitted by other citizens in surrounding communities through airnoise.io.
>
> In the past ten weeks since launch of airnoise.io in our area, **nearly 53,000 detailed, individual noise complaints** have been filed with the MAA. Generally, these are now being filed at the rate of **over 1,000 a day.** Prior to the implementation of the FAA's NextGen, BWI received only about 300 noise complaints a year.
>
> It's time to fix this NextGen-related BWI noise pollution problem.
>
> ***Witness: We will not be the sacrificial lambs who are slaughtered to spare the holy cash cow that is BWI.***
>
> Barbara Deckert
> 6075 Claire Drive

Elkridge, MD 21075
410-796-0628

cc: Governor Larry Hogan
http://governor.maryland.gov/mail/default.asp

October 08, 2018

Time	Complaint Type	Aircraft	Operator	Callsign	Dist (mi)	Altitude
08:05 am	Commercial	BOEING 737-823	American Airlines	AAL2582	2.6	4450
08:06 am	Commercial	1995 AIRBUS INDUSTRIE A320-232	United Airlines	UAL2055	3.36	2400
08:10 am	Commercial	---	---			
08:11 am	Commercial	---	---			
08:19 am	Commercial	Boeing 737NG 7Q8/W	Southwest Airlines	SWA2525	1.42	625
08:20 am	Commercial	1988 MCDONNELL DOUGLAS AIRCRAFT CO MD-88	DELTA AIR LINES INC - ATLAN...	DAL2641	3.27	5300
08:20 am	Commercial	2002 BOEING 737-7CT	Southwest Airlines	SWA1623	2.48	575
08:22 am	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA784	3.54	1075
08:23 am	Commercial	Airbus A320 232SL	Spirit Airlines	NKS141	2.45	2950
08:26 am	Commercial	---	---	SWA2387	2.6	4000
08:35 am	Commercial	Embraer EMB-175 SR	Air Canada Express	SKV7608	2.58	9875

08:36 am	Commercial	2005 AIRBUS A319-132	Spirit Airlines	NKS554	3.22	650
08:37 am	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA270	2.54	4300
08:38 am	Business Aviation	---	---	SKV7501	4.08	3000
08:40 am	General Aviation	---	---	FDY651	3.78	1100
08:42 am	Commercial	2000 BOEING 737-7H4	Southwest Airlines	SWA2315	3.54	5750
08:43 am	Commercial	Airbus A319 133	Spirit Airlines	NKS557	2.57	5300
08:45 am	Commercial	---	---			
08:48 am	Commercial	1999 BOEING 737-7H4	Southwest Airlines	SWA2104	3.21	5775
08:49 am	Commercial	2010 AIRBUS A320-232	Spirit Airlines	NKS2025	2.45	550
08:51 am	Commercial	2012 BOEING 737-924ER	United Airlines	UAL270	2.65	4050
08:52 am	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA2396	2.68	3825
08:53 am	Commercial	2003 BOEING 737-7CT	Southwest Airlines	SWA1696	1.67	700
08:56 am	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA2476	3.17	5075
08:57 am	Commercial	Boeing 767 36NERBDSF	Prime Air	GTI3554	3.96	1050
09:32 am	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA176	3.29	950
09:35 am	Commercial	2006 EMBRAER ERJ 190-100 IGW	JetBlue Airways	JBU427	3.03	875
10:12 am	Commercial	2012 BOEING 737-924ER	United Airlines	UAL566	3.5	6775
10:29 am	General Aviation	1978 PIPER PA-32-300	MORGANTOWN FLYING CLUB LLC ...		0.24	5601
		1990				

10:30 am	Commercial	MCDONNELL DOUGLAS AIRCRAFT CO MD-88	WILMINGTON TRUST CO TRUSTEE...	DAL1925	2.64	4375
10:37 am	Commercial	BOEING 737-8H4	Southwest Airlines	SWA357	2.7	4425
12:25 pm	Commercial	2011 AIRBUS A320-232	Spirit Airlines	NKS381	2.47	4325
12:26 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2301	3.2	900
12:35 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA785	3.66	825
12:37 pm	Commercial	Airbus A320 271NSL	Spirit Airlines	NKS113	3.71	5625
12:39 pm	Commercial	2012 EMBRAER ERJ 190-100 IGW	JETBLUE AIRWAYS CORP - LONG...	JBU455	4.39	9600
12:45 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA653	2.65	550
12:49 pm	Commercial	2003 BOEING 737-7H4	Southwest Airlines	SWA3459	4.83	2850
12:50 pm	Commercial	1999 BOEING MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL1153	3.21	800
12:52 pm	Business Aviation	2000 CESSNA 560XL	KS AIR 3-7-12 IV LLC - CHAR...		2.61	6300
12:53 pm	Commercial	---	---	SWA152	2.5	5000
12:59 pm	Commercial	2011 AIRBUS A320-232	Spirit Airlines	NKS821	2.38	4200
01:00 pm	Business Aviation	2013 CESSNA 525A	TURBOJACK LLC - RIDGELAND, MS	N327PD	2.89	750
01:11 pm	Commercial	2000 AIRBUS INDUSTRIE A320-214	American Airlines	AAL1717	4.26	1300
01:14 pm	Commercial	Boeing 737NG 76N/W	Southwest Airlines	SWA8302	4.54	1350
01:21	Commercial	---	---			

pm						
01:23 pm	Commercial	1996 MCDONNELL DOUGLAS MD-90-30	WELLS FARGO DELAWARE TRUST ...	DAL1233	4.7	9025
01:32 pm	Commercial	2005 BOEING 737-7H4	Southwest Airlines	SWA2369	4.16	6150
01:32 pm	Commercial	2006 BOEING 737-7H4	Southwest Airlines	SWA126	3.46	1025
04:53 pm	Commercial	2000 BOEING 737-832	Delta Air Lines	DAL1189	2.57	4575
04:54 pm	Commercial	2008 BOEING 737-924ER	United Airlines	UAL307	3.49	1025
04:56 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA789	3.56	950
04:56 pm	Commercial	2005 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3447	2.6	5425
04:58 pm	Commercial	2004 EMBRAER EMB-145LR	AMERICAN AIRLINES INC - FOR...	ENY3796	4.35	1150
05:01 pm	Commercial	2004 AIRBUS A320-232	JetBlue Airways	JBU1212	2.69	725
05:03 pm	Commercial	BOEING 757-232	Delta Air Lines	DAL1361	3.35	1000
05:04 pm	Commercial	Embraer EMB-175 SU	Air Canada Express	SKV7504	2.9	824
05:04 pm	Commercial	2001 EMBRAER EMB-135LR	WELLS FARGO BANK NORTHWEST ...	VTE3104	2.67	6975
05:05 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA2492	2.45	575
05:09 pm	Commercial	2009 BOEING 737-890	Alaska Airlines	ASA726	2.47	550
05:10 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA2318	2.65	4450
06:36 pm	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA1759	2.61	5000
06:36 pm	Commercial	1999 BOEING 737-7H4	Southwest Airlines	SWA504	2.88	800

06:37 pm	Commercial	Embraer EMB-175 SU	Air Canada Express	SKV7505	2.36	4300
06:38 pm	Commercial	Boeing 737NG 7BK/W	Southwest Airlines	SWA2509	2.68	650
06:39 pm	Commercial	Airbus A320 232SL	Spirit Airlines	NKS202	3.3	950
06:41 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA224	3.09	900
06:45 pm	Commercial	1998 MCDONNELL DOUGLAS DC-9-83(MD-83)	WELLS FARGO BANK NORTHWEST ...	AAL1185	2.55	525
06:50 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA113	2.66	4275
06:51 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2096	2.7	4975
06:53 pm	Business Aviation	Embraer Legacy 450	Flexjet	LXJ419	2.26	7025
07:07 pm	Commercial	2004 BOMBARDIER INC CL-600-2B19	US AIRWAYS INC - FORT WORTH...	JIA5065	1.92	9950
07:10 pm	General Aviation	---	---	FDY861	1.61	600
07:11 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA1318	2.79	675
07:12 pm	Commercial	Boeing 787 8	British Airways	BAW229	4.21	1275
07:14 pm	Commercial	Embraer EMB-175 200LR	United Express	RPA3637	4.5	9650
07:16 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA2494	3.79	600
07:18 pm	Commercial	1999 BOEING MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL875	2.81	6525
07:20 pm	Commercial	1999 AIRBUS INDUSTRIE A319-112	American Airlines	AAL1664	3.01	825
07:22 pm	Commercial	Boeing 757 256/W	Icelandair	ICE643	3.02	850

07:24 pm	Commercial	Embraer EMB-175 200LR	American Eagle	ENY3366	2.55	625
07:28 pm	Commercial	1998 BOEING 737-7H4	Southwest Airlines	SWA2417	4.97	8575
07:28 pm	Commercial	2007 BOEING 737-7H4	Southwest Airlines		3.78	925
07:30 pm	Commercial	2005 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3425	3.59	5900
07:31 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA1555	3.42	1025
07:36 pm	Commercial	2003 BOEING 737-7H4	Southwest Airlines	SWA213	2.71	5525
07:39 pm	Commercial	2005 AIRBUS A319-132	Spirit Airlines	NKS559	2.47	4975
07:40 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA1330	2.58	550
07:41 pm	Commercial	Boeing 737NG 7Q8/W	Southwest Airlines	SWA2509	2.53	5150
07:41 pm	Commercial	Airbus A320 271NSL	Spirit Airlines	NKS1112	2.8	725
07:45 pm	Commercial	2003 BOEING 737-7H4	Southwest Airlines	SWA1903	4.52	6000
07:46 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA225	2.56	3625
07:51 pm	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA1123	2.59	4175
07:53 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA2377	2.65	4750
07:59 pm	Commercial	1998 MCDONNELL DOUGLAS MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL1637	2.81	7400
08:01 pm	Commercial	1999 BOEING 737-7H4	Southwest Airlines	SWA506	2.52	4975
08:02 pm	Commercial	737-8H4	Southwest Airlines	SWA1776	2.63	5175
08:03 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA2462	2.67	3950

08:05 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA2143	2.64	4700
08:08 pm	Commercial	2015 BOEING 737-8H4	Southwest Airlines	SWA1154	2.61	3750
08:10 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA248	2.62	4600
08:24 pm	Commercial	2007 AIRBUS A319-132	Spirit Airlines	NKS115	2.63	4500
08:25 pm	Commercial	1999 AIRBUS INDUSTRIE A319-112	American Airlines	AAL1664	2.27	4225
08:28 pm	Commercial	737-8H4	Southwest Airlines	SWA503	3.34	875
08:31 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA1555	2.56	3675
08:32 pm	Commercial	2007 BOEING 737-7H4	Southwest Airlines	SWA301	4.8	2725
08:35 pm	General Aviation	---	---	MTN7456	1.68	800
08:36 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA2464	2.64	675
08:39 pm	General Aviation	---	---	MTN7457	1.71	2500
08:41 pm	Business Aviation	Bombardier Global 6000	East West Air LLC	N70EW	2.78	750
08:43 pm	Commercial	Embraer EMB-175 200LR	American Eagle	ENY3396	2.35	5475
08:45 pm	Commercial	2006 EMBRAER ERJ 190-100 IGW	JetBlue Airways	JBU1027	3.34	925
08:47 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA1473	3.01	850
08:48 pm	Commercial	Airbus A320 271NSL	Spirit Airlines	NKS1117	2.56	4775
08:54 pm	Commercial	---	---	SWA483	3.58	3000
08:57 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA239	3.72	1100
08:59		Boeing 737-	Southwest			

pm	Commercial	76N	Airlines	SWA2205	4.0	1050
09:01 pm	Commercial	2002 BOEING 737-73V	WELLS FARGO BANK NORTHWEST ...	SWA2197	3.12	825
09:02 pm	Business Aviation	---	---			
09:04 pm	Commercial	Airbus A320 232SL	Spirit Airlines	NKS106	3.06	850
09:06 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA1586	3.01	850
09:07 pm	Commercial	BOEING 737-752	Southwest Airlines	SWA1565	2.83	725
09:09 pm	Commercial	Boeing 737-MAX 8	Boeing	SWA1995	2.67	700
09:16 pm	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA2408	2.54	600
09:19 pm	Commercial	2002 BOEING 737-7H4	Southwest Airlines	SWA1393	2.36	900

October 09, 2018

Time	Complaint Type	Aircraft	Operator	Callsign	Dist (mi)	Altitude
08:11 am	Commercial	---	---			
08:21 am	Commercial	2002 BOEING 737-73V	WELLS FARGO BANK NORTHWEST ...	SWA201	2.75	775
08:39 am	Commercial	2011 EMBRAER ERJ 190-100 IGW	JETBLUE AIRWAYS CORP - LONG...	JBU1789	1.27	9625
08:40 am	Commercial	---	---	SWA329	2.33	500
08:42 am	Commercial	2002 BOEING 737-7H4	Southwest Airlines	SWA1645	2.5	4025
08:43 am	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA2436	2.65	700
08:45	Commercial	2013 BOEING	Southwest	SWA357	3.09	5350

am		737-8H4	Airlines			
08:46 am	Commercial	BOEING 737-7Q8	Southwest Airlines	SWA414	3.31	5550
08:47 am	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA1618	4.7	3000
08:49 am	Commercial	Boeing 737NG 932ER/W	Delta Air Lines	DAL1301	2.63	5375
08:51 am	Commercial	2007 BOEING 737-7H4	Southwest Airlines	SWA2396	2.68	4075
08:52 am	Commercial	2001 EMBRAER EMB-135LR	WELLS FARGO BANK NORTHWEST ...	VTE3101	3.7	975
08:53 am	Commercial	2012 AIRBUS A320-232	Spirit Airlines	NKS667	2.43	4250
08:56 am	Commercial	Boeing 737-MAX 8	Boeing	SWA385	2.29	6550
08:58 am	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA2476	2.57	5950
09:00 am	Commercial	Embraer EMB-175 SU	Air Canada Express	SKV7502	4.42	1400
09:01 am	Commercial	2006 BOEING 737-7H4	Southwest Airlines	SWA2491	0.73	5950
09:03 am	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA1607	4.78	2650
09:04 am	General Aviation	---	---	FDY1053	1.66	400
09:06 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2262	2.62	3950
09:07 am	Commercial	2005 BOEING 737-7H4	Southwest Airlines	SWA426	5.0	2750
09:08 am	General Aviation	---	---	FDY851	1.58	700
09:11 am	Commercial	2015 BOEING 767-3S2F	FedEx	FDX694	2.72	7450
10:35 am	Commercial	1998 BOEING 737-7H4	Southwest Airlines	SWA314	4.13	1400
10:47 am	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA766	2.52	600

10:52 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA1815	3.63	5775
10:56 am	Commercial	Airbus A320 271NSL	Spirit Airlines	NKS112	2.63	525
11:02 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA3671	2.8	4075
04:11 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2206	2.59	4100
04:19 pm	Commercial	---	---	SWA1118	3.74	600
04:20 pm	Commercial	2001 EMBRAER EMB-135LR	WELLS FARGO BANK NORTHWEST ...	VTE3103	4.5	1475
04:21 pm	Business Aviation	---	---	FET78	3.45	4700
04:26 pm	Business Aviation	---	---			
04:44 pm	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA756	4.57	2200
04:46 pm	Commercial	1998 BOEING MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL553	2.39	600
04:46 pm	Helicopter	---	---			
04:54 pm	Commercial	Boeing 767 232BDSF	ABX Air	ABX3436	4.46	525
04:55 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2386	3.15	1025
05:00 pm	Commercial	2005 EMBRAER EMB-145LR	American Eagle - Envoy Air	ENY3796	3.84	1250
05:00 pm	Commercial	BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3447	2.52	4675
05:04 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA1759	2.66	7575
05:05 pm	Commercial	BOEING 737-76N	Southwest Airlines	SWA1355	3.59	525
05:05		BOEING 737-	Southwest			

pm	Commercial	8H4	Airlines	SWA2492	4.38	1200
05:07 pm	Commercial	Boeing 767 306ERBDSF	Prime Air	GTI6902	3.94	1275
05:09 pm	General Aviation	---	---			
05:11 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA8503	3.55	1000
05:15 pm	Commercial	2009 BOEING 737-890	Alaska Airlines	ASA726	2.55	525
05:16 pm	General Aviation	---	---	FDY581	1.65	700
05:19 pm	Business Aviation	1998 ISRAEL AIRCRAFT INDUSTRIES ASTRA SPX	WELLS FARGO BANK NORTHWEST ...	N6EL	3.22	875
05:20 pm	Commercial	---	---	SWA153	3.3	4200
05:21 pm	Commercial	2014 BOEING 737-932ER	Delta Air Lines	DAL1361	4.56	5150
05:24 pm	Commercial	2001 BOEING 737-7H4	Southwest Airlines	SWA2043	4.71	2900
05:28 pm	Commercial	2014 BOEING 737-924ER	United Airlines	UAL473	2.58	4850
05:31 pm	Commercial	2006 AIRBUS A319-132	Spirit Airlines	NKS782	3.49	950
05:38 pm	Commercial	2006 BOEING 737-76N	AFS INVESTMENTS 55 LLC - NO...	SWA1309	3.68	1200
05:39 pm	Commercial	2002 AIRBUS A320-232	American Airlines	AAL1931	2.77	3575
10:46 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA625	2.52	4525
10:50 pm	Commercial	---	---			
10:53 pm	Commercial	Boeing 737NG 76Q/W	Southwest Airlines	SWA726	2.42	6200
10:57 pm	Commercial	---	---			
11:01		2000 AIRBUS	American			

pm	Commercial	INDUSTRIE A320-214	Airlines	AAL1876	2.27	5025

October 10, 2018

Time	Complaint Type	Aircraft	Operator	Callsign	Dist (mi)	Altitude
09:25 am	Commercial	2006 BOEING 737-7H4	Southwest Airlines	SWA201	3.34	4050
09:27 am	Commercial	---	---	EDV5259	3.15	4500
09:31 am	Helicopter	EUROCOPTER DEUTSCHLAND GMBH EC 135 P2	Aircare PHI INC - LAFAYETTE...	N329PH	1.68	975
09:32 am	Commercial	BOEING 737-8H4	Southwest Airlines	SWA176	3.77	1150
09:33 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA1815	4.33	1350
09:35 am	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA1623	4.68	6775
09:37 am	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA3671	4.39	1475
09:39 am	Commercial	1998 BOEING 737-705	Southwest Airlines		2.68	5625
09:40 am	Commercial	BOEING 737-8H4	Southwest Airlines	SWA974	3.56	1225
09:44 am	Commercial	2015 BOEING 737-8H4	Southwest Airlines	SWA2126	3.41	1550
09:48 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2306	2.59	525
09:50 am	Commercial	1998 BOEING MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL674	2.47	7050
09:50 am	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA2436	3.19	3900
09:53 am	Commercial	2006 BOEING 737-7H4	Southwest Airlines	SWA939	4.85	600
09:55 am	Commercial	2004 EMBRAER EMB-145LR	American Eagle - Envoy Air	PDT4891	3.85	1475

09:58 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA3827	4.28	1200
10:01 am	Commercial	2005 BOEING 737-7H4	Southwest Airlines	SWA430	3.58	950
10:04 am	General Aviation	1977 PIPER PA-32-300	JOHNSTON CRAIG J - OCEAN CI...	N38331	1.79	5850
10:06 am	Commercial	Boeing 737NG 79P/W	Southwest Airlines	SWA379	2.31	525
11:21 am	Commercial	---	---	DAL2660	2.53	4000
11:28 am	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA1374	4.4	6750
11:28 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA495	2.68	4475
11:31 am	Commercial	1996 MCDONNELL DOUGLAS MD-90-30	WELLS FARGO DELAWARE TRUST ...	DAL2608	3.37	9100
11:36 am	Commercial	2014 AIRBUS INDUSTRIE A321-231	American Airlines	AAL609	2.44	6750
11:44 am	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA1625	3.33	1100
11:56 am	Commercial	Boeing 767 232BDSF	ABX Air	ABX3937	2.41	6525
11:57 am	Commercial	Boeing 737NG 752/W	Southwest Airlines	SWA5896	1.11	4875
11:58 am	Commercial	1998 EMBRAER EMB-145LR	American Airlines	LOF4261	1.69	9850
12:20 pm	Commercial	Boeing 737NG 79P/W	Southwest Airlines	SWA1490	2.52	850
12:24 pm	Commercial	Boeing 737NG 73V/W	Southwest Airlines	SWA2326	0.52	6075
12:32 pm	Commercial	2009 BOEING 737-7H4	Southwest Airlines	SWA2369	2.24	525
12:33 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2301	3.33	875
12:36 pm	Commercial	2003 BOMBARDIER INC CL-600-	WELLS FARGO BANK NORTHWEST	JIA5224	1.57	9850

		2B19	...			
12:36 pm	Business Aviation	1989 BEECH 300	SPENCER AVIATION INC - ALEX...	N15613	4.42	5800
12:37 pm	Commercial	737-8H4	Southwest Airlines	SWA785	3.27	1175
12:43 pm	Commercial	1998 BOEING 737-7H4	Southwest Airlines	SWA3459	0.78	3850
12:47 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2292	3.33	1050
12:51 pm	Commercial	2007 BOEING 737-7H4	Southwest Airlines	SWA2211	2.16	6475
12:52 pm	Commercial	2006 BOEING 737-7BD	Southwest Airlines	SWA1976	2.76	800
12:53 pm	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA1716	2.34	500
12:56 pm	Commercial	---	---	SWA1325	3.65	1300
12:59 pm	Business Aviation	Cessna Citation Sovereign	General Motors	N271PH	3.66	6400
01:32 pm	Commercial	2012 AIRBUS A321-231	American Airlines	AAL1717	2.52	875
03:09 pm	Commercial	1987 MCDONNELL DOUGLAS AIRCRAFT CO MD-88	WILMINGTON TRUST COMPANY TR...	DAL1271	4.82	1300
03:12 pm	Commercial	2015 BOEING 737-8H4	Southwest Airlines	SWA2155	2.76	925
03:13 pm	General Aviation	1979 CESSNA 182Q	DIPIETRO A LOUIS STOVER JAM...	N799BS	1.16	6000
03:15 pm	Commercial	Bombardier CRJ 200LR	Air Canada Express	JZA8122	3.5	1400
03:17 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2338	2.6	850
03:21 pm	Commercial	1991 MCDONNELL DOUGLAS AIRCRAFT CO	DELTA AIR LINES INC - ATLAN...	DAL1425	2.58	4675

		MD-88				
03:23 pm	Commercial	2004 BOEING 737-7BD	Southwest Airlines	SWA2278	3.6	925
03:23 pm	Commercial	2005 EMBRAER EMB-145LR	American Eagle - Envoy Air	PDT4976	4.92	1775
03:25 pm	Commercial	1998 BOEING 737-7H4	Southwest Airlines	SWA756	4.54	1750
03:26 pm	Business Aviation	Embraer Phenom 300	Embraer	EJA326	1.99	575
03:29 pm	Commercial	Embraer EMB-175 200LR	American Eagle	ENY3553	2.32	4450
03:34 pm	Commercial	1998 BOEING 737-7H4	Southwest Airlines	SWA2170	3.44	925
03:36 pm	Commercial	2012 BOEING 737-8H4	WILMINGTON TRUST CO TRUSTEE...	SWA1056	2.58	5325
03:36 pm	Commercial	Boeing 737NG 7L9/W	Southwest Airlines	SWA2245	2.73	775
03:39 pm	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA1759	3.64	1600
03:43 pm	Commercial	1998 MCDONNELL DOUGLAS DC-9-83(MD-83)	WELLS FARGO BANK NORTHWEST ...	AAL2368	3.09	5950
03:44 pm	Commercial	2007 BOEING 737-7H4	Southwest Airlines	SWA923	3.39	4925
03:46 pm	Commercial	2007 BOEING 737-7BD	Southwest Airlines	SWA1663	3.2	4275
03:49 pm	Commercial	ERJ170-200LR	Republic Airline	RPA4762	4.93	9925
03:50 pm	Commercial	2001 BOEING 737-7H4	Southwest Airlines	SWA2181	3.21	3875
03:51 pm	Commercial	2008 BOEING 737-924ER	United Airlines	UAL1528	2.75	925
03:55 pm	Commercial	Boeing 737NG 932ER/W	Delta Air Lines	DAL782	2.59	800
03:56 pm	Business Aviation	Bombardier Challenger 350	NetJets	EJA791	3.14	6900
04:00 pm	Commercial	---	---	SWA1902	4.17	800

04:56 pm	Commercial	1997 MCDONNELL DOUGLAS MD-90-30	Delta Air Lines	DAL541	3.67	1425
05:04 pm	Commercial	2004 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3447	2.51	4850
05:08 pm	Commercial	1999 BOEING 737-7H4	Southwest Airlines	SWA221	3.76	3525
05:10 pm	Commercial	2006 AIRBUS A320-214	Virgin America	ASA1126	2.64	950
05:12 pm	Commercial	2010 EMBRAER ERJ 190-100 IGW	JetBlue Airways	JBU1089	3.68	9950
05:33 pm	Commercial	2013 BOEING 737-924ER	United Airlines	UAL307	3.31	1025
05:35 pm	Commercial	Embraer EMB-175 SU	Air Canada Express		4.55	2325
05:39 pm	Commercial	1999 AIRBUS INDUSTRIE A320-232	American Airlines	AAL1931	2.66	5650
05:41 pm	Commercial	Airbus A321 253NSL	WOW air	WOW6SV	3.13	1275
05:45 pm	Commercial	Boeing 737NG 76Q/W	Southwest Airlines	SWA1309	3.64	1250
05:49 pm	Business Aviation	---	---			
06:00 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA826	2.62	950
06:02 pm	General Aviation	---	---	FDY410	4.53	6000
06:03 pm	Commercial	1997 MCDONNELL DOUGLAS MD-90-30	Delta Air Lines	DAL2613	2.63	5775
06:04 pm	Commercial	2014 AIRBUS A320-232	Spirit Airlines	NKS202	3.41	1250
06:06 pm	Commercial	2004 EMBRAER EMB-145LR	American Airlines	ENY3766	2.83	4000
06:10	Commercial	2006 BOEING	Southwest	SWA1188	3.3	1050

pm		737-7BD	Airlines			
06:13 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA247	2.44	775
06:14 pm	Commercial	---	---	EDV5504	2.31	700
06:16 pm	Commercial	Boeing 767 3S2F	FedEx Express	FDX753	3.26	1325
06:19 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA2054	2.6	875
06:21 pm	Commercial	1999 MCDONNELL DOUGLAS DC-9-83(MD-83)	WELLS FARGO BANK NORTHWEST ...	AAL1185	2.37	600
06:22 pm	Business Aviation	Embraer Phenom 300	Flight Options	OPT366	1.78	6975
06:24 pm	Commercial	2007 BOEING 737-7H4	Southwest Airlines	SWA281	2.22	3975
06:24 pm	Commercial	2009 BOEING 737-890	Alaska Airlines	ASA731	3.82	3200
06:26 pm	Commercial	1999 BOEING 737-7H4	Southwest Airlines	SWA1006	2.57	950
06:29 pm	Commercial	2005 BOEING 737-7H4	Southwest Airlines	SWA504	3.63	850
06:30 pm	Commercial	1993 AIRBUS INDUSTRIE A300B4-605R	FedEx	FDX592	3.72	1225
06:37 pm	Commercial	ERJ170-200LR	REPUBLIC AIRLINE INC - INDI...	RPA4515	2.57	9975
06:37 pm	Commercial	Boeing 737NG 7K9	Southwest Airlines	SWA213	3.22	900
06:40 pm	Commercial	2013 BOEING 737-924ER	United Airlines	UAL249	2.6	5925
06:41 pm	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA2509	4.07	650
06:42 pm	Commercial	BOEING 737-8H4	Southwest Airlines	SWA27	3.39	1225
06:45 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2494	2.64	1000
06:50		1999 BOEING	Southwest			

pm	Commercial	737-7H4	Airlines	SWA1634	2.21	650
06:52 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA113	2.72	6100
06:55 pm	Commercial	2015 BOEING 737-8H4	Southwest Airlines	SWA259	2.75	1125
06:57 pm	Commercial	2006 AIRBUS A319-132	Spirit Airlines	NKS414	3.18	1175
07:00 pm	Commercial	2009 BOEING 737-7H4	Southwest Airlines	SWA765	3.02	1100
07:05 pm	Commercial	Boeing 737NG 924ER/W	United Airlines	UAL2059	2.63	5675
07:11 pm	Commercial	2006 AIRBUS A320-214	Virgin America	ASA1127	2.77	3700
07:14 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA1318	3.56	1275
07:16 pm	Commercial	2006 BOEING 737-7BD	Southwest Airlines	SWA1188	2.54	4650
07:18 pm	Commercial	1999 AIRBUS INDUSTRIE A319-112	American Airlines	AAL1664	2.83	1125
07:20 pm	Commercial	Airbus A320 232SL	Spirit Airlines	NKS548	2.9	1125
07:36 pm	Commercial	2005 BOEING 737-7H4	Southwest Airlines		3.17	900
07:39 pm	Commercial	2004 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3425	2.44	4575
07:40 pm	Commercial	BOEING 737-8H4	Southwest Airlines	SWA1330	2.32	725
07:41 pm	Commercial	2006 BOEING 737-7H4	Southwest Airlines	SWA1903	2.13	5100
07:42 pm	Commercial	Airbus A319 133	Spirit Airlines	NKS556	2.34	625
07:42 pm	Commercial	Boeing 737NG 7K9	Southwest Airlines	SWA213	1.93	6000
07:44 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA1141	3.92	1725
07:47	Commercial	2015 BOEING	Southwest	SWA225	2.77	4025

pm		737-8H4	Airlines			
07:48 pm	Commercial	MCDONNELL DOUGLAS MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL1637	2.34	800
07:49 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2462	2.68	4350
07:52 pm	Commercial	2001 AIRBUS INDUSTRIE A321-211	American Airlines	AAL1897	2.55	925
07:57 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA2377	3.06	4550
07:57 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA970	2.65	1100
07:59 pm	Commercial	2005 BOEING 737-7H4	Southwest Airlines	SWA506	2.45	4800
08:01 pm	Commercial	Boeing 787 9	British Airways	BAW229	3.61	1250
08:03 pm	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA1555	2.54	4350
08:05 pm	Commercial	1996 MCDONNELL DOUGLAS MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL2024	2.31	575
08:07 pm	Commercial	2002 BOEING 737-7BX	ALC B377 30746 LLC - LOS AN...	SWA1776	3.31	5425
08:10 pm	Commercial	2009 BOEING 737-7H4	Southwest Airlines	SWA765	2.49	4725
08:12 pm	General Aviation	---	---	MTN7456	1.49	1000
08:13 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA1318	2.56	4500
08:17 pm	Commercial	1997 BOEING 737-7H4	Southwest Airlines	SWA1138	2.27	650
08:18 pm	Commercial	1999 AIRBUS INDUSTRIE A319-112	American Airlines	AAL1664	2.3	4550
08:26 pm	Commercial	Embraer EMB-175 200LR	American Eagle	ENY3396	3.11	5600
08:28 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA239	4.24	1450

08:32 pm	Commercial	BOEING 737-8H4	Southwest Airlines	SWA2408	4.08	1700
08:34 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA1473	2.31	725
08:44 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA2182	3.05	1375

October 11, 2018

Time	Complaint Type	Aircraft	Operator	Callsign	Dist (mi)	Altitude
08:58 am	Commercial	2000 BOEING 737-7H4	Southwest Airlines	SWA426	2.54	4675
08:59 am	Commercial	BOEING 737-8H4	Southwest Airlines	SWA2476	2.78	5100
09:01 am	Commercial	Embraer EMB-175 SU	Air Canada Express	SKV7502	4.36	1850
09:20 am	Commercial	1987 MCDONNELL DOUGLAS AIRCRAFT CO MD-88	DELTA AIR LINES INC - ATLAN...	DAL1502	2.78	6275
09:22 am	Commercial	1998 BOEING 737-7H4	Southwest Airlines	SWA1623	2.54	5275
09:24 am	Commercial	1992 MCDONNELL DOUGLAS AIRCRAFT CO MD-88	DELTA AIR LINES INC - ATLAN...	DAL1925	2.77	1250
10:13 am	Commercial	Embraer EMB-175 SU	Air Canada Express	SKV7503	2.37	4625
10:14 am	Commercial	---	---	EDV3439	3.16	4200
10:21 am	Commercial	1992 MCDONNELL DOUGLAS AIRCRAFT CO MD-88	DELTA AIR LINES INC - ATLAN...	DAL1925	2.32	4450
10:26 am	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA2538	2.57	4825
10:31 am	Commercial	---	---			

10:32 am	Business Aviation	2001 RAYTHEON AIRCRAFT COMPANY 400A	HINCOJET LLC - PORTAGE, MI		2.33	800
10:33 am	Commercial	1999 BOEING 737-7H4	Southwest Airlines	SWA713	3.15	1450
10:38 am	Commercial	2012 AIRBUS A320-232	Spirit Airlines	NKS112	4.13	1825
10:44 am	Commercial	---	---	SWA277	2.52	1000
10:49 am	Commercial	1997 MCDONNELL DOUGLAS MD-90-30	Delta Air Lines	DAL2608	2.44	775
10:53 am	Commercial	2013 BOEING 737-8H4	WELLS FARGO BANK NORTHWEST ...	SWA766	2.31	800
10:55 am	Commercial	2015 BOEING 737-8H4	Southwest Airlines	SWA1815	3.39	6075
10:57 am	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA177	2.61	5475
11:06 am	Commercial	2000 BOEING 737-7H4	Southwest Airlines	SWA939	3.02	7050
11:07 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA975	2.58	5700
11:08 am	Commercial	2015 AIRBUS A320-232	Spirit Airlines	NKS368	2.31	875
11:11 am	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA1758	2.34	950
11:13 am	Commercial	MCDONNELL DOUGLAS MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL1903	2.47	1150
11:15 am	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA3671	4.36	7025
11:15 am	Commercial	---	---			
11:19 am	Commercial	2014 AIRBUS A320-232	Spirit Airlines	NKS390	2.31	800
11:24		2011 BOEING	Southwest			

am	Commercial	737-7H4	Airlines	SWA1163	4.6	3625
11:29 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA4521	2.32	800
11:30 am	Commercial	BOEING 737-8H4	Southwest Airlines	SWA495	2.55	5500
12:50 pm	Commercial	2014 AIRBUS A320-232	Spirit Airlines	NKS821	2.32	4525
12:58 pm	Commercial	Boeing 737NG 73V/W	Southwest Airlines	SWA2474	2.39	1075
01:00 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA1325	2.31	900
01:05 pm	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA653	2.31	900
01:16 pm	Commercial	2005 BOEING 737-76N	Southwest Airlines	SWA2346	2.3	850
01:20 pm	Commercial	1997 MCDONNELL DOUGLAS MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL1233	4.67	4051
03:21 pm	Commercial	2005 BOEING 737-7H4	Southwest Airlines	SWA2589	2.33	1850
03:32 pm	Commercial	BOEING 737-705	Southwest Airlines	SWA2251	4.1	3575
03:38 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA1056	2.25	1775
03:41 pm	Commercial	1998 MCDONNELL DOUGLAS DC-9-83(MD-83)	AMERICAN AIRLINES INC - FOR...	AAL2368	3.57	3275
03:41 pm	Commercial	---	---	SWA2245	2.47	2100
03:44 pm	Commercial	---	---	SWA280	2.29	1800
03:45 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA521	2.09	1925
03:46 pm	Commercial	2001 BOEING 737-76N	Southwest Airlines	SWA2109	2.47	2250
03:52 pm	Commercial	BOEING 737-76Q	Southwest Airlines	SWA1902	2.17	1900

04:18 pm	Commercial	2000 AIRBUS INDUSTRIE A320-232	American Airlines	AAL413	3.75	2625
04:18 pm	Commercial	Bombardier CRJ 200LR	Air Canada Express	JZA8123	2.28	1900
04:30 pm	Commercial	2006 BOEING 737-7BD	Southwest Airlines	SWA300	2.34	1875
04:33 pm	Commercial	---	---	SWA2307	2.16	700
04:37 pm	Commercial	Boeing 737NG 900ER/W	Alaska Airlines	ASA765	2.38	2300
04:37 pm	Commercial	BOEING 737-830	American Airlines	AAL103	2.06	2000
04:38 pm	Commercial	Airbus A320 214SL	Allegiant Air	AAY1272	2.29	2125
04:40 pm	Commercial	---	---			
04:41 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA2155	2.55	2825
04:45 pm	Commercial	1990 MCDONNELL DOUGLAS AIRCRAFT CO MD-88	DELTA AIR LINES INC - ATLAN...	DAL1271	2.47	2325
04:51 pm	Commercial	---	---	DAL1189	3.43	2300
04:52 pm	Commercial	Boeing 777 2U8ER	Omni Air International	OAE828	2.09	2475
04:54 pm	Commercial	---	---	SWA2338	2.72	1200
05:08 pm	General Aviation	---	---	FDY581	4.61	600
05:11 pm	Helicopter	---	---			
05:12 pm	Commercial	1999 EMBRAER EMB-145LR	American Eagle - Envoy Air	PDT4976	3.28	1850
05:13 pm	Helicopter	---	---			
05:20 pm	General Aviation	---	---	FDY956	5.26	4200

05:22 pm	Commercial	BOEING 737-932ER	Delta Air Lines	DAL1361	2.14	1625
05:24 pm	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA519	4.78	2400
05:30 pm	Commercial	---	---	DAL553	4.7	600
05:34 pm	Commercial	1998 BOEING 737-7H4	Southwest Airlines	SWA2043	3.43	2675
05:35 pm	Commercial	---	---	JBU1526	2.61	1200
05:37 pm	General Aviation	---	---	FDY582	2.39	1200
05:41 pm	Commercial	---	---	SWA221	2.16	800
05:49 pm	Commercial	Boeing 737NG 7Q8	Southwest Airlines	SWA1118	2.42	1675
06:21 pm	Commercial	Embraer EMB-175 SU	Air Canada Express	SKV7505	2.29	2550
06:23 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA1614	2.19	2075
06:24 pm	Commercial	2015 BOEING 737-924ER	United Airlines	UAL249	2.39	1700
06:25 pm	Commercial	2015 BOEING 737-8H4	Southwest Airlines	SWA790	2.55	1575
06:27 pm	Commercial	---	---	ENY3766	2.16	700
06:30 pm	Commercial	---	---	SWA281	5.75	600
06:32 pm	Commercial	2006 AIRBUS A319-132	Spirit Airlines	NKS782	2.54	1700
06:35 pm	Commercial	---	---	SWA224	4.75	600
06:43 pm	Commercial	---	---	SWA1309	2.16	600
06:48 pm	Commercial	---	---			
06:49 pm	Commercial	1996 MCDONNELL DOUGLAS	WELLS FARGO DELAWARE	DAL1906	2.35	1725

		MD-90-30	TRUST ...			
06:52 pm	Commercial	2006 AIRBUS A319-112	Virgin America	ASA1127	2.73	2250
06:55 pm	Commercial	---	---			
07:01 pm	Commercial	---	---			
07:05 pm	Commercial	---	---	SWA419	2.69	1100
07:07 pm	Commercial	2013 AIRBUS A320-232	Spirit Airlines	NKS935	2.25	1950
07:09 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2096	2.44	1650
07:16 pm	Commercial	Boeing 737NG 800/W	American Airlines	AAL275	2.4	1550
07:18 pm	Commercial	---	---	SWA2278	1.87	1700
07:20 pm	Commercial	---	---	ENY3366	6.23	1100
07:23 pm	Commercial	---	---			
07:24 pm	Commercial	1989 MCDONNELL DOUGLAS DC-9-82(MD-82)	American Airlines	AAL1185	3.43	3425
07:26 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA113	2.39	1825
07:34 pm	Commercial	---	---	SWA1010	2.16	800
07:38 pm	Commercial	---	---	JBU1211	2.52	1600
07:40 pm	Commercial	BOEING 737-76Q	Southwest Airlines	SWA1903	2.59	1275
07:42 pm	Commercial	AIRBUS A320-232	Spirit Airlines	NKS443	2.21	2050
07:43 pm	Commercial	---	---			
07:44 pm	Commercial	---	---	SWA2417	1.87	1400

07:47 pm	Commercial	---	---			
07:55 pm	Commercial	2006 AIRBUS A319-132	Spirit Airlines	NKS559	2.76	2775
07:56 pm	Commercial	---	---			
07:57 pm	Commercial	---	---			
07:58 pm	Commercial	1998 AIRBUS INDUSTRIE A320-232	United Airlines	UAL2059	2.19	1775
08:00 pm	Commercial	---	---			
08:01 pm	Commercial	---	---	SWA282	2.73	600
08:02 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2377	2.35	1675
08:07 pm	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA1138	2.6	1300
08:09 pm	Commercial	Airbus A320 232SL	Spirit Airlines	NKS106	3.07	1525
08:12 pm	Commercial	2011 BOEING 737-7H4	Southwest Airlines	SWA506	4.65	5675
08:15 pm	Commercial	MCDONNELL DOUGLAS MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL1637	4.08	8200
08:19 pm	Commercial	Embraer EMB-175 200LR	American Eagle	ENY3396	3.0	5750
08:23 pm	General Aviation	---	---			
08:23 pm	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA1154	4.61	6975
08:27 pm	Commercial	2006 BOEING 737-7BD	Southwest Airlines	SWA331	3.16	5225
08:31 pm	Commercial	2004 EMBRAER EMB-145LR	TRANS STATES AIRLINES LLC -...	LOF636	2.39	875
08:32 pm	Commercial	2006 BOEING 737-7H4	Southwest Airlines	SWA1926	2.62	6400

08:34 pm	Business Aviation	TEXTRON AVIATION INC 525B	TEXTRON AVIATION INC - WICH...	N872J	2.27	925
08:35 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2143	2.6	7575
08:36 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA1473	2.54	1200
08:41 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA248	2.46	7625
08:45 pm	Commercial	Airbus A321 211SL	WOW air	WOW118	2.47	3875
08:48 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA1689	3.19	1600
08:52 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA781	2.67	1425
08:54 pm	Commercial	BOEING 737-79P	WILMINGTON TRUST CO TRUSTEE...	SWA394	3.27	1550
08:58 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA1586	3.14	1600
09:01 pm	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA2205	3.29	1625

October 12, 2018

Time	Complaint Type	Aircraft	Operator	Callsign	Dist (mi)	Altitude
09:28 am	General Aviation	---	---	FDY574	0.63	2500
09:36 am	Commercial	2008 BOEING 737-7H4	WELLS FARGO BANK NORTHWEST ...	SWA2190	2.67	3825
09:38 am	General Aviation	---	---	FDY1054	2.28	5000
09:41 am	Business Aviation	Bombardier Challenger 650	NetJets	EJA206	1.76	2575
09:47 am	Commercial	---	---	SWA2306	5.72	700
09:49 am	General Aviation	---	---	FDY852	1.33	2600

10:11 am	Commercial	---	---	UAL566	2.31	1600
10:17 am	Commercial	1987 MCDONNELL DOUGLAS AIRCRAFT CO MD-88	WILMINGTON TRUST COMPANY TR...	DAL1925	3.72	4075
10:25 am	Commercial	---	---	DAL2608	5.62	700
10:27 am	Commercial	Boeing 737NG 752/W	Southwest Airlines	SWA2538	2.39	1700
10:28 am	Commercial	2013 AIRBUS A320-232	Spirit Airlines	NKS2025	2.4	2000
10:30 am	General Aviation	---	---	FDY352	1.35	1800
11:16 am	Commercial	2001 BOEING 737-7H4	Southwest Airlines	SWA939	2.93	4900
11:22 am	Commercial	Boeing 737-7H4 (Illinois One Livery)	Southwest Airlines (Illinoi...	SWA821	4.3	3275
11:24 am	Commercial	---	---			
11:24 am	Commercial	---	---	SWA2126	3.13	4000
11:25 am	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA495	2.08	1975
11:27 am	Commercial	Boeing 767 306ERBCF	Prime Air	GTI3561	2.26	3575
11:30 am	Commercial	---	---	DAL2608	3.45	4600
11:31 am	Commercial	BOEING 737-7H4	Southwest Airlines	SWA393	4.58	3450
11:59 am	Commercial	2010 BOEING 737-7H4	Southwest Airlines	SWA278	3.72	3525
12:00 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA767	2.34	1725
12:02 pm	Commercial	BOEING 737-7CT	Southwest Airlines	SWA2522	3.83	4150
12:10 pm	Commercial	2014 AIRBUS A320-232	Spirit Airlines	NKS113	2.19	2475

12:14 pm	Helicopter	EUROCOPTER DEUTSCHLAND GMBH MBB-BK 117 C-2	CENTER FOR EMERGENCY MEDICI...	N522ME	4.52	1100
12:14 pm	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA2326	2.51	3825
12:15 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA1758	2.58	2300
12:16 pm	Commercial	2009 BOEING 737-823	American Airlines	AAL2529	2.35	2375
12:20 pm	Commercial	---	---	EDV5259	5.65	3600
12:30 pm	Business Aviation	2013 EMBRAER S A EMB-505	NetJets	EJA327	1.32	3600
12:35 pm	Commercial	---	---			
12:38 pm	Commercial	---	---	SWA785	5.7	700
12:40 pm	Commercial	---	---	SWA2292	5.69	700
01:52 pm	Commercial	---	---	SWA2348	5.32	600
01:58 pm	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA2281	3.03	3625
03:23 pm	Commercial	1987 MCDONNELL DOUGLAS AIRCRAFT CO MD-88	WILMINGTON TRUST COMPANY TR...	DAL1425	3.28	3175
03:40 pm	Commercial	2007 BOEING 737-7H4	Southwest Airlines	SWA2181	2.44	2925
03:41 pm	Commercial	---	---			
03:43 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA521	2.98	3225
03:43 pm	Commercial	---	---			
03:45 pm	Commercial	---	---	AAL2368	2.16	700
03:46 pm	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA2474	2.28	2425

03:48 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA1056	3.11	3350
03:49 pm	Commercial	2001 BOEING 737-76Q	WELLS FARGO BANK NORTHWEST ...	SWA1902	2.96	3750
04:30 pm	Commercial	BOEING 737-76N	SouthWest Airlines	SWA300	2.4	1850
04:32 pm	Helicopter	EUROCOPTER DEUTSCHLAND GMBH MBB-BK 117 C-2	CENTER FOR EMERGENCY MEDICI...	N522ME	4.54	1175
04:33 pm	Commercial	2007 BOEING 737-7H4	Southwest Airlines	SWA2170	2.27	2650
04:33 pm	Commercial	1999 EMBRAER EMB-145LR	AMERICAN AIRLINES INC - FOR...	PDT4976	2.42	2150
04:35 pm	Commercial	---	---			
04:35 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA220	2.11	2400
04:37 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA2338	3.32	2525
04:39 pm	Commercial	---	---			
04:39 pm	Commercial	---	---	SWA2437	4.84	3500
04:40 pm	Commercial	---	---	ASA765	2.21	2000
04:42 pm	Commercial	---	---	SWA756	1.87	1700
04:45 pm	Business Aviation	Cessna Citation Sovereign	Cloud Nine Aviation LLC	N998G	1.86	3050
04:47 pm	Business Aviation	2005 ISRAEL AIRCRAFT INDUSTRIES GULFSTREAM 200	MIAMI JET PROFESSIONALS LLC...		1.34	4525
04:49 pm	Commercial	---	---			
04:49	Business	2014 EMBRAER EXECUTIVE				

pm	Aviation	AIRCRAFT INC EMB-505	FlexJet	OPT361	1.37	3150
04:52 pm	Commercial	2001 BOEING 737-832	Delta Air Lines	DAL1189	2.44	1625
04:54 pm	Commercial	---	---	SWA1309	5.33	600
05:11 pm	Business Aviation	---	---			
05:12 pm	Commercial	2013 BOEING 737-823	American Airlines	AAL275	4.6	3400
05:13 pm	Business Aviation	---	---			
05:14 pm	Business Aviation	---	---			
05:15 pm	Commercial	2005 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV5210	3.46	2200
05:16 pm	Commercial	Boeing 737NG 900ER/W	Delta Air Lines	DAL1361	2.13	1775
05:19 pm	Commercial	---	---	SWA810	5.68	700
05:23 pm	Commercial	Embraer EMB-175 SU	Air Canada Express	SKV7505	2.84	1250
05:26 pm	Commercial	1999 BOEING 737-7H4	Southwest Airlines	SWA221	2.45	2925
05:33 pm	Commercial	---	---			
05:33 pm	Commercial	2013 BOEING 737-924ER	United Airlines	UAL473	2.13	2025
05:35 pm	Commercial	AIRBUS INDUSTRIE A320-232	American Airlines	AAL1931	2.15	2000
05:40 pm	Business Aviation	---	---			
05:42 pm	General Aviation	---	---	FDY582	2.19	2900
05:44 pm	Commercial	1999 BOEING 737-7H4	Southwest Airlines	SWA2043	3.32	4325

05:45 pm	Commercial	2004 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3447	2.36	2825
05:45 pm	Commercial	BOEING 737-8H4	Southwest Airlines	SWA790	2.31	1900
05:46 pm	Commercial	---	---			
05:48 pm	Commercial	---	---	NKS454	6.43	900
05:49 pm	Business Aviation	2009 CESSNA 510	SONFLIGHT LLC - CONCORD, MA	N786AF	3.51	5625
05:50 pm	Commercial	2004 AIRBUS A320-232	JetBlue Airways	JBU1211	2.42	1875
05:52 pm	Commercial	---	---	SWA2528	5.42	600
05:53 pm	Commercial	2005 BOEING 737-76N	Southwest Airlines	SWA2307	2.55	1600
05:56 pm	Business Aviation	Embraer Phenom 300	NetJets	EJA402	1.93	2750
05:58 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA1614	2.32	1675
06:00 pm	Commercial	BOEING MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL2613	2.63	1525
06:06 pm	Commercial	---	---	DAL1906	2.74	800
06:10 pm	Commercial	2005 EMBRAER EMB-145LR	American Eagle - Envoy Air	ENY3766	2.27	2575
06:13 pm	Business Aviation	2007 CESSNA 560XL	WELLS FARGO BANK NORTHWEST ...	N669TT	1.39	6125
06:14 pm	Business Aviation	---	---			
06:17 pm	Business Aviation	DASSAULT AVIATION FALCON 900EX	VILLAGES EQUIPMENT CO - LEE...	N902YP	2.47	1925
06:17 pm	Commercial	2014 BOEING 737-924ER	United Airlines	UAL249	2.11	2000
06:25 pm	Commercial	2009 BOEING 737-890	Alaska Airlines	ASA731	2.71	2800

06:50 pm	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA2096	2.14	2450
06:51 pm	Commercial	2011 AIRBUS A320-214	Virgin America	ASA1127	2.46	2225
06:54 pm	Commercial	2014 AIRBUS A320-232	Spirit Airlines	NKS935	2.65	1700
06:58 pm	Commercial	---	---	SWA1118	2.16	1000
07:03 pm	Commercial	1996 AIRBUS INDUSTRIE A320-232	United Airlines	UAL2059	2.17	2050
07:06 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA419	2.68	1475
07:08 pm	Commercial	2007 AIRBUS A319-132	Spirit Airlines	NKS8929	2.49	2275
07:22 pm	Commercial	---	---			
07:22 pm	Commercial	2007 BOEING 737-7H4	Southwest Airlines		1.52	3525
07:29 pm	Commercial	---	---	PDT4861	2.62	9000
07:31 pm	Commercial	2004 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3425	2.04	2650
07:33 pm	Commercial	2002 BOEING 737-7CT	Southwest Airlines	SWA2417	4.41	4925
07:37 pm	Commercial	1999 MCDONNELL DOUGLAS DC-9-83(MD-83)	WELLS FARGO BANK NORTHWEST ...	AAL1185	2.55	2725
07:37 pm	Commercial	2004 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3416	2.57	2575
07:39 pm	Commercial	2007 AIRBUS A319-132	Spirit Airlines	NKS559	2.46	1850
07:41 pm	Commercial	Airbus A320 271NSL	Spirit Airlines	NKS2030	2.54	1925
07:44 pm	Commercial	Boeing 737NG 7Q8/W	Southwest Airlines	SWA213	2.5	3075

07:45 pm	Commercial	Boeing 737NG 79P/W	Southwest Airlines	SWA2509	2.39	1725
07:46 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA2143	2.19	1725
07:47 pm	Commercial	Airbus A321 253NSL	WOW air		2.56	1475
07:49 pm	Commercial	---	---	SWA1903	2.73	600
07:51 pm	Commercial	1996 MCDONNELL DOUGLAS MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL875	2.76	3425
07:51 pm	Commercial	Airbus A320 232SL	Spirit Airlines	NKS443	2.35	2150

October 13, 2018

Time	Complaint Type	Aircraft	Operator	Callsign	Dist (mi)	Altitude
09:19 am	Commercial	2007 BOEING 737-7H4	Southwest Airlines	SWA4786	3.34	3775
09:21 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA2737	2.1	1950
09:24 am	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA4513	4.03	4675
09:25 am	Commercial	Airbus A320 232SL	Spirit Airlines	NKS667	2.35	2150
09:27 am	Commercial	1992 BOEING 747-446	ATLAS AIR INC - PURCHASE, NY	GTI8622	2.34	2225
09:29 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA3159	2.08	1925
09:31 am	Business Aviation	Dassault Falcon 50	Tamara LLC	N979JC	2.34	2675
09:33 am	Commercial	---	---	SWA2677	5.63	2000
09:34 am	Commercial	Boeing 767 316ER/W	Prime Air	GTI3555	2.75	2675
09:37		2012 BOEING	WILMINGTON			

am	Commercial	737-8H4	TRUST CO TRUSTEE...	SWA3183	2.08	2125
09:38 am	Commercial	---	---	SWA5185	5.62	600
09:42 am	Commercial	2001 EMBRAER EMB-135LR	WELLS FARGO BANK NORTHWEST ...	VTE3102	3.06	4450
09:45 am	Commercial	---	---	SWA5490	2.16	900
10:01 am	Commercial	2005 AIRBUS A319-132	Spirit Airlines	NKS453	2.42	2625
10:09 am	Commercial	---	---			
10:10 am	Commercial	2014 BOEING 737-924ER	United Airlines	UAL566	2.08	1850
10:12 am	Business Aviation	---	---	SKV7503	2.74	1000
10:13 am	Commercial	BOEING 737-79P	Southwest Airlines	SWA1611	2.55	1350
10:18 am	Commercial	2007 AIRBUS A319-132	Spirit Airlines	NKS305	2.52	1625
10:22 am	Commercial	2002 BOEING 737-7H4	Southwest Airlines	SWA1824	4.58	3350
10:23 am	Commercial	2005 BOEING 737-7H4	Southwest Airlines	SWA4961	3.58	4550
10:26 am	Commercial	2013 BOEING 737-823	American Airlines	AAL1227	2.23	2075
10:27 am	Commercial	2004 BOMBARDIER INC CL-600-2B19	US AIRWAYS INC - FORT WORTH...	JIA5706	1.95	9950
10:36 am	Commercial	---	---			
11:11 am	Commercial	BOEING 737-76N	Southwest Airlines	SWA1420	2.57	3500
11:12 am	Commercial	2001 BOEING 737-7H4	Southwest Airlines	SWA4371	3.68	2750
11:12 am	Commercial	2001 BOEING 737-7H4	Southwest Airlines	SWA3256	2.14	2800

11:13 am	Commercial	2006 AIRBUS A319-132	Spirit Airlines	NKS781	2.27	2275
11:14 am	Commercial	1999 BOEING 737-7H4	Southwest Airlines		2.03	2375
11:14 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA3400	2.45	1650
11:17 am	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA505	2.33	1700
11:19 am	Commercial	---	---	SWA2257	3.61	600
11:26 am	Business Aviation	---	---			
11:30 am	Commercial	---	---			
11:31 am	Commercial	Boeing 737NG 7Q8	Southwest Airlines	SWA3242	2.52	1875
11:33 am	Commercial	Boeing 767 36NERBDSF	Prime Air	GTI3561	2.43	2650
11:35 am	General Aviation	Cessna 172S Skyhawk SP	Private	N2464H	0.98	7100
11:39 am	Commercial	2000 BOEING 737-7H4	Southwest Airlines	SWA1804	4.67	3300
11:49 am	Commercial	---	---			
11:50 am	Commercial	2007 BOEING 737-7BD	Southwest Airlines	SWA3784	2.39	2125
11:51 am	Commercial	1999 BOEING 737-7H4	Southwest Airlines	SWA3367	2.45	2250
12:04 pm	General Aviation	---	---			
12:05 pm	Commercial	Boeing 737NG 7Q8/W	Southwest Airlines		2.34	2425
12:09 pm	Commercial	2014 AIRBUS A320-232	Spirit Airlines	NKS381	2.46	1950
12:13 pm	Commercial	2012 AIRBUS A320-232	Spirit Airlines	NKS113	2.47	1600
12:32 pm	Commercial	---	---	DAL2660	3.47	4000
12:39	Commercial	1998 EMBRAER	American	LOF4275	1.67	9975

pm		EMB-145	Airlines			
12:44 pm	Commercial	---	---			
12:57 pm	General Aviation	---	---	FDY872	3.08	3500
01:16 pm	Commercial	2006 BOEING 737-76N	Southwest Airlines	SWA3490	2.34	1925
01:24 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA3363	1.7	1975
03:03 pm	Commercial	---	---	NKS950	6.19	700
03:07 pm	Commercial	1997 MCDONNELL DOUGLAS MD-90-30	Delta Air Lines	DAL1451	2.25	2600
03:09 pm	Commercial	2014 EMBRAER S A ERJ170-200LR	REPUBLIC AIRLINE INC - INDI...	RPA4610	3.67	10000
03:10 pm	Commercial	BOEING 737-76N	Southwest Airlines	SWA4714	2.11	2875
03:12 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA3587	2.3	1700
03:14 pm	Commercial	2004 BOEING 737-7H4	Southwest Airlines	SWA5189	4.42	2525
03:22 pm	Business Aviation	2005 BOMBARDIER INC BD-100-1A10	FLEXJET LLC ACKER DAVID SMI...	LXJ517	0.86	3750
03:24 pm	Commercial	Embraer EMB-175 200LR	American Eagle	ENY3553	2.04	2000
03:31 pm	Helicopter	---	---			
03:32 pm	Commercial	---	---	AAL413	1.87	1700
03:40 pm	Commercial	2003 BOMBARDIER INC CL-600-2C10	American Airlines	JIA5666	4.41	9925
03:41 pm	Commercial	---	---	SWA3339	1.98	2100
03:42						

pm	Commercial	---	---			
04:02 pm	Commercial	Bombardier CRJ 200ER	Air Canada Express	JZA8123	4.14	4750
04:04 pm	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA3363	2.52	2525
08:11 pm	Commercial	---	---	SWA3918	6.6	700
08:13 pm	Commercial	2004 BOEING 737-76N	Southwest Airlines	SWA5293	2.09	1825
08:15 pm	Commercial	2004 EMBRAER EMB-145LR	AMERICAN AIRLINES INC - FOR...	ENY3396	2.33	2950
08:20 pm	Commercial	2006 AIRBUS A319-132	Spirit Airlines	NKS115	2.26	1825
08:27 pm	Business Aviation	---	---			
08:32 pm	Commercial	2012 AIRBUS A320-232	Spirit Airlines	NKS1117	2.29	1650
08:34 pm	Commercial	---	---			
08:35 pm	Commercial	2000 BOEING 737-7H4	Southwest Airlines	SWA5191	4.5	4000
08:41 pm	Commercial	Boeing 737-7H4 (Illinois One Livery)	Southwest Airlines (Illinoi...		2.03	1850
09:03 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA4685	2.43	1400
09:07 pm	Commercial	Airbus A320 232SL	Spirit Airlines	NKS443	2.39	1875
09:07 pm	Helicopter	EUROCOPTER DEUTSCHLAND GMBH MBB-BK 117 C-2	CENTER FOR EMERGENCY MEDICI...	N522ME	4.57	825
09:21 pm	Commercial	1990 BOEING 767-3S1	ATLAS AIR INC - PURCHASE, NY	GTI8976	2.62	2150
09:24 pm	Commercial	2015 AIRBUS A320-232	Spirit Airlines	NKS1030	2.42	1725
09:32	Commercial	2006 BOEING	Southwest	SWA3732	3.6	3025

pm	737-7H4	Airlines

October 14, 2018

Time	Complaint Type	Aircraft	Operator	Callsign	Dist (mi)	Altitude
10:09 am	Business Aviation	2002 ISRAEL AIRCRAFT INDUSTRIES GULFSTREAM 200	DARBY HOLDINGS LLC - BALTIM...	N360SJ	1.99	4650
10:17 am	Commercial	1990 MCDONNELL DOUGLAS AIRCRAFT CO MD-88	WILMINGTON TRUST CO TRUSTEE...	DAL1925	3.91	3326
10:18 am	Commercial	---	---			
10:20 am	Commercial	2007 AIRBUS A319-132	Spirit Airlines	NKS305	2.32	1550
10:26 am	Commercial	Airbus A320 232SL	Spirit Airlines	NKS141	2.26	1875
10:28 am	Commercial	2007 BOEING 737-7H4	Southwest Airlines		2.12	1925
10:30 am	Commercial	2001 BOEING 737-7H4	Southwest Airlines	SWA5600	2.24	2175
10:32 am	Business Aviation	---	---			
10:33 am	Commercial	1997 BOEING 737-7H4	Southwest Airlines	SWA3348	2.6	1975
10:34 am	General Aviation	---	---	FDY882	2.94	3100
10:36 am	Business Aviation	Embraer Phenom 300	JetSuite Air	RSP899	0.35	3650
10:40 am	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA1619	2.17	1225
10:43 am	Commercial	Embraer EMB-175 SU	Air Canada Express	SKV7503	3.42	3475
10:43 am	General Aviation	2008 CIRRUS DESIGN CORP SR22	TRAVELSAFELY LLC - CROWNSVI...	N888DN	1.49	1625

10:44 am	Commercial	---	---	SWA3146	6.64	500
10:48 am	Commercial	2004 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3486	2.9	2850
10:49 am	Commercial	2015 AIRBUS A320-232	Spirit Airlines	NKS547	2.47	1375
10:51 am	Commercial	2009 BOEING 737-7BD	Southwest Airlines	SWA906	2.29	1375
10:53 am	Commercial	---	---			
10:57 am	Commercial	Boeing 767 36NERBDSF	Prime Air	GTI3555	2.61	4175
11:00 am	Commercial	2003 EMBRAER EMB-145LR	WELLS FARGO BANK NORTHWEST ...	LOF4261	1.38	9650
11:01 am	Commercial	2001 EMBRAER EMB-145LR	AMERICAN AIRLINES INC - FOR...	PDT4891	2.88	2000
11:11 am	Commercial	2006 AIRBUS A319-132	Spirit Airlines		2.62	875
11:19 am	Commercial	2008 BOEING 737-7H4	Southwest Airlines	SWA1418	4.05	3925
11:26 am	Commercial	---	---	SWA5552	2.11	1600
11:33 am	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA3858	2.07	1375
11:34 am	Commercial	Boeing 737NG 8H4/W	Southwest Airlines		2.56	850
11:42 am	Commercial	Boeing 737NG 79P/W	Southwest Airlines	SWA3146	3.92	3250
11:43 am	Commercial	2003 BOEING 737-7H4	Southwest Airlines	SWA5540	2.62	3450
11:44 am	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA5516	2.06	1475
11:49 am	Commercial	Embraer Lineage 1000 E	MGM Mirage Inc	N785MM	2.37	1975
11:51 am	Commercial	2012 BOEING 737-8H4	Southwest Airlines	SWA4354	2.36	1125

12:41 pm	General Aviation	---	---	FDY496	2.48	2100
01:06 pm	Commercial	---	---	SWA5382	3.41	3000
01:13 pm	Commercial	---	---			
01:20 pm	Commercial	2006 EMBRAER ERJ 190-100 IGW	WELLS FARGO BANK NW NA TRUS...	JBU126	3.03	2625
01:35 pm	Commercial	BOEING 737-79P	Southwest Airlines	SWA3915	4.44	3676
01:39 pm	Commercial	---	---	SWA2966	2.16	1000
01:41 pm	General Aviation	---	---	FDY552	1.34	1500
01:43 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA5605	3.1	2375
01:46 pm	Commercial	2001 BOEING 737-7H4	Southwest Airlines	SWA3302	2.52	2275
01:50 pm	Business Aviation	CESSNA 560XL	NetJets	EJA678	1.29	4575
01:53 pm	Commercial	1998 BOEING 737-7H4	SOUTHWEST AIRLINES CO - DAL...	SWA5693	2.34	2225
02:58 pm	Commercial	BOMBARDIER INC CL-600-2B19	US AIRWAYS INC - FORT WORTH...	JIA5665	3.38	9850
02:59 pm	Business Aviation	2007 DASSAULT AVIATION MYSTERE-FALCON 50	N180NL HOLDINGS LLC - HALLA...	N180NL	4.15	4700
03:01 pm	Business Aviation	---	---			
03:01 pm	Commercial	Boeing 737NG 752/W	Southwest Airlines	SWA3771	2.26	1650
03:23 pm	Business Aviation	---	---			
03:25	Commercial	2004 BOMBARDIER	WELLS FARGO BANK	EDV5140	3.98	3425

pm		INC CL-600-2B19	NORTHWEST ...			
03:26 pm	General Aviation	1984 BEECH F33A	PHILLIPS DAVID A - CHARLEST...	N69302	0.66	6399
03:27 pm	Commercial	2005 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV5210	2.35	2200
03:29 pm	Commercial	2003 BOEING 737-7CT	Southwest Airlines	SWA2607	2.51	2300
03:31 pm	Commercial	2000 AIRBUS INDUSTRIE A320-214	American Airlines	AAL413	2.11	1950
03:31 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA3483	2.17	1250
03:38 pm	Business Aviation	---	---			
03:40 pm	Business Aviation	Textron Aviation Citation Latitude	NetJets	EJA570	1.3	2475
03:45 pm	Commercial	1999 MCDONNELL DOUGLAS DC-9-83(MD-83)	WELLS FARGO BANK NORTHWEST ...	AAL2368	2.91	2350
03:47 pm	Commercial	EMBRAER ERJ 170-100SU	REPUBLIC AIRLINES INC - IND...	RPA5915	4.78	9725
04:10 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA1699	2.65	950
04:15 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA3820	2.06	1775
04:21 pm	Commercial	---	---			
04:21 pm	Commercial	2000 BOEING 737-7H4	Southwest Airlines	SWA4113	3.96	3301
04:22 pm	Commercial	2008 BOEING 737-924ER	United Airlines	UAL1779	2.07	1400
04:28 pm	Commercial	---	---	NKS385	2.56	1000

04:30 pm	Commercial	2013 BOEING 737-8H4	Southwest Airlines	SWA5290	2.3	1400
04:31 pm	Commercial	---	---			
04:33 pm	Commercial	---	---	SWA3543	3.39	2500
04:34 pm	General Aviation	---	---			
04:35 pm	Commercial	2012 BOEING 737-990ER	Alaska Airlines	ASA765	2.32	1100
04:37 pm	Commercial	---	---	SWA5502	2.16	900
04:38 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA4980	2.31	1200
04:41 pm	Business Aviation	---	---			
04:41 pm	Commercial	Boeing 737MAX 8	Southwest Airlines	SWA4174	2.24	1275
04:43 pm	Commercial	---	---	SWA4768	2.7	800
04:46 pm	Business Aviation	Cessna Citation Excel	flyExclusive	N836JS	4.75	7375
04:48 pm	Commercial	---	---	SWA5308	2.17	1100
04:49 pm	Commercial	---	---	SWA1532	1.98	1800
04:51 pm	Commercial	---	---	SWA5652	3.2	800
04:52 pm	Commercial	2001 BOEING 737-832	Delta Air Lines	DAL1189	2.03	1625
04:54 pm	Commercial	---	---	SWA5192	1.89	2100
04:58 pm	Commercial	2002 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3447	2.03	1950
05:00 pm	Commercial	2001 BOEING 737-7H4	Southwest Airlines	SWA3956	4.16	3800
05:01 pm	Commercial	Boeing 737NG 79P/W	Southwest Airlines	SWA2524	2.28	1625

05:04 pm	Commercial	---	---			
05:05 pm	Commercial	BOEING 737-7Q8	Southwest Airlines	SWA5414	4.24	3325
05:08 pm	Commercial	---	---			
05:09 pm	Commercial	2001 EMBRAER EMB-135LR	WELLS FARGO BANK NORTHWEST ...	VTE3104	4.75	4400
05:10 pm	Business Aviation	Bombardier Global 5000	Appaloosa Management LP	N793AP	2.33	1775
05:11 pm	Commercial	2013 BOEING 737-823	WILMINGTON TRUST CO TRUSTEE...	AAL2773	4.25	9700
05:11 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA3437	2.29	1650
05:19 pm	Commercial	Embraer EMB-175 SR	Air Canada Express	SKV7505	2.69	2725
05:21 pm	Commercial	---	---	SWA4306	2.16	1200
05:24 pm	Commercial	---	---			
05:26 pm	Business Aviation	---	---			
05:30 pm	Commercial	---	---			
05:31 pm	Commercial	Embraer EMB-175 200LR	American Eagle	ENY3553	2.06	1950
05:35 pm	Commercial	---	---			
05:35 pm	Commercial	1998 AIRBUS INDUSTRIE A320-232	American Airlines	AAL1931	2.06	1575
05:36 pm	Commercial	BOEING 737-932ER	Delta Air Lines	DAL1361	2.03	1550
05:38 pm	Commercial	---	---			
05:39 pm	Commercial	2013 BOEING 737-924ER	United Airlines	UAL473	2.11	1550
05:39	General					

pm	Aviation	---	---			
05:45 pm	Commercial	---	---			
05:46 pm	Commercial	---	---			
05:46 pm	Commercial	2011 BOEING 737-7H4	Southwest Airlines	SWA4570	3.01	2775
05:50 pm	Commercial	---	---			
05:50 pm	Commercial	2001 BOEING 737-7H4	Southwest Airlines	SWA4375	3.52	3125
06:08 pm	Commercial	2003 AIRBUS A320-232	JetBlue Airways	JBU1211	2.32	1800
06:10 pm	Commercial	2010 BOEING 737-890	Alaska Airlines	ASA731	2.43	1975
06:11 pm	General Aviation	---	---	FDY887	6.47	900
06:11 pm	Business Aviation	---	---			
06:13 pm	Commercial	---	---	UAL249	2.14	1200
06:17 pm	Commercial	---	---	ENY3766	2.36	1100
06:19 pm	Business Aviation	2014 PILATUS AIRCRAFT LTD PC-12/47E	FIREMAN DANIEL M CROOK JAME...	CNS7	3.62	5725
06:22 pm	Commercial	2004 BOMBARDIER INC CL-600-2B19	AFS INVESTMENTS 71 LLC - NO...	JIA5401	4.46	9725
06:23 pm	Commercial	2005 BOEING 737-7H4	Southwest Airlines	SWA3108	4.5	3450
06:23 pm	Commercial	2006 AIRBUS A319-132	Spirit Airlines	NKS782	2.13	2025
06:38 pm	Commercial	Boeing 737-823 (AirCal Heritage Livery)	American Airlines	AAL275	2.35	1175
06:40 pm	Commercial	---	---	SWA4670	3.2	700

06:41 pm	Commercial	2007 EMBRAER ERJ 190-100 IGW	US AIRWAYS INC - FORT WORTH...	AAL2117	4.08	9725
06:43 pm	Business Aviation	---	---			
06:44 pm	General Aviation	---	---	FDY888	2.53	8000
06:44 pm	Commercial	Airbus A320 232SL	Spirit Airlines	NKS935	2.11	1875
06:46 pm	Commercial	---	---	ASA1127	2.27	1500
06:48 pm	General Aviation	---	---	FDY996	1.8	1100
06:50 pm	Commercial	2011 AIRBUS A321-231	American Airlines	AAL9476	2.11	1650
06:57 pm	Commercial	2006 BOEING 737-76N	AFS INVESTMENTS 57 LLC - NO...		2.37	1475
06:58 pm	Commercial	2014 BOEING 737-8H4	Southwest Airlines	SWA5311	2.1	1325
07:00 pm	Commercial	---	---	SWA4085	3.08	2200
07:02 pm	Commercial	2003 BOEING 737-7H4	Southwest Airlines	SWA4438	2.55	2224
07:03 pm	Commercial	1998 AIRBUS INDUSTRIE A319-131	United Airlines	UAL2059	2.17	1325
07:11 pm	Commercial	---	---	SWA3862	2.53	1000
07:13 pm	Commercial	---	---			
07:14 pm	Commercial	1998 BOEING 737-7H4	Southwest Airlines	SWA2076	4.2	2675
07:15 pm	Commercial	---	---			
07:16 pm	Commercial	---	---	SWA5058	1.98	2100
07:19 pm	Commercial	---	---	SWA3524	2.16	800

07:20 pm	Commercial	2004 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3416	2.35	1325
07:22 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA4691	2.08	1425
07:24 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA5635	2.14	1400
07:26 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA2928	2.53	950
07:27 pm	Commercial	2004 BOMBARDIER INC CL-600-2B19	WELLS FARGO BANK NORTHWEST ...	EDV3425	2.28	1150
07:29 pm	Commercial	BOEING MD-90-30	DELTA AIR LINES INC - ATLAN...	DAL875	3.12	3075
07:31 pm	Commercial	---	---	SWA9015	2.16	800
07:31 pm	Commercial	Boeing 737NG 800/W	Southwest Airlines	SWA5453	2.56	925
07:34 pm	Commercial	Boeing 737NG 7Q8/W	Southwest Airlines	SWA5390	2.58	2900
07:36 pm	Commercial	2005 BOEING 737-7H4	Southwest Airlines	SWA4613	2.28	1750
07:37 pm	Commercial	2005 AIRBUS A319-132	Spirit Airlines	NKS559	2.3	1300
07:40 pm	Commercial	2000 BOEING 737-7H4	Southwest Airlines	SWA5752	4.2	3275
07:42 pm	Commercial	---	---			
07:43 pm	Commercial	2000 BOEING 737-7H4	Southwest Airlines	SWA3129	3.08	3350
07:44 pm	Commercial	---	---			
07:44 pm	Commercial	1999 MCDONNELL DOUGLAS DC-9-83(MD-83)	WELLS FARGO BANK NORTHWEST ...	AAL1185	4.14	3200
07:45	Commercial	Boeing 737NG	Southwest Airlines	SWA2143	2.06	1775

pm		752/W				
07:46 pm	Commercial	Boeing 737NG 8H4/W	Southwest Airlines	SWA3888	2.32	1300
07:49 pm	Commercial	2014 AIRBUS A320-232	Spirit Airlines	NKS443	2.39	1500
07:55 pm	Commercial	Airbus A321 211SL	WOW air	WOW118	2.44	1250
07:59 pm	Commercial	Airbus A320 214SL	Allegiant Air	AAY1245	2.41	2500

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Written Statement 2:

Anne Cowles, no location provided

From: Anne Cowles <annecowles58@gmail.com>
Sent: Monday, October 15, 2018 1:22 PM
To: Schwab, Gregory (FAA) <gregory.schwab@faa.gov>
Subject: NextGen Advisoty Committee Meeting Oct.31

Dear Sir,
I wanted to let the committee know that ever since the installation of Next Gen satellite system my outdoor work with horses(which is is my livelihood)has been constantly disturbed and disrupted my the noise and air pollution over my farm property.
I no longer enjoy being out of doors during the day .
At night time I have to use a window AC unit to block out the noise from the almost continual air traffic.
There have been two occasions where the horses were agitated by too low and/or too frequent flights.
This was never an issue before NextGen and I feel like I live right next to an Airport yet ,I am 20 plus miles away!
I hope that a much more equitable solution can be found that at least mimics the vectoring of aircraft before NextGen and that no more air traffic added to the skies until this solution is found!
Sincerely,
Anne Cowles

Attachment 4

Approved by the NextGen Advisory Committee October 2018

NextGen Integration Working Group Rolling Plan 2019-2021 Final Report

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

October 2018

Contents

NextGen Integration Working Group Rolling Plan 2019 - 2021

Background/Introduction

Since inception in 2014, the NextGen Integration Working Group has successfully delivered operational benefits with industry against the joint commitments made in the Joint Implementation Plan and the NextGen Priorities Update. Together the FAA and the aviation community have delivered 174 of 178 commitments to date advancing NextGen at target locations and producing useful and measurable benefits to industry and the U.S. National Airspace System (NAS). Progress of NextGen Priorities is twofold: implementation of the commitments jointly agreed to in the work plan and the resulting operational outcomes and benefits realized. The last NextGen Priorities Joint Implementation Plan, 2017-2019 was published in October 2016 and contained FAA-industry agreed milestones through 2019 in four focus areas: Multiple Runway Operations, Surface Operations and Data Sharing, Data Communications, and Performance Based Navigation. The 2017 Joint Implementation Plan Update included a new NextGen Priority area, the Northeast Corridor (NEC), the busy airspace between Washington, D.C., and Boston that includes Philadelphia and New York City, and associated airspace.

The 3-year focus of this work connects planning closer to the operation and combined with FAA's responsiveness continues to make this an extremely productive effort. The Joint Analysis Team Results provide performance impacts and benefits of some of these capabilities to date and provide a collective FAA and Industry common statement of fact.

Executive Summary

The recommendations herein roll the NextGen Priorities Joint Implementation Plan forward through calendar year 2021 with capabilities that meet the "high benefit, high readiness" criteria that has been the hallmark of NextGen Priorities success. The commitments included outline specific FAA and Industry commitments for the next three years in four key areas to advance NextGen: Data Comm, Multiple Runway Operations, Performance Based Navigation, and Surface and Data Sharing are fundamental to moving the National Airspace System forward offering greater flexibility and operational benefits in a more integrated airspace.

From the last set of NAC recommendations on NextGen Priorities in June of 2016, there has been considerable progress in delivering operational benefits and meeting or exceeding planned commitments. The recommendations in this report build on this foundation and encompass some stretch goals.

The Data Comm NIWG has been a premier example of working together and delivering benefits to industry stakeholders and the NAS as a whole. After completing tower services at 55 sites, the FAA added 7 additional sites, at the request of industry, and completed them nearly a year ahead of schedule and under budget. The JAT analyzed the benefits of tower services and determined that it saves both time and fuel, estimating taxi-out time savings of up to 8.5 minutes per flight in off-nominal operations at studied sites. Using the methods established with the JAT, a comprehensive analysis of Data Comm benefits identified $54M in airline and passenger savings for the year of 2017.

This next 2019 to 2021 plan moves to deploy the en route initial services across all 20 en route control centers expanding the benefits across all phases of flight in the NAS. Data Comm has also taken on the tough issues in order to identify risks and mitigations to ensure all stakeholders can address any shortfalls to successfully implement the program as committed. The plan looks to address issues with both air and ground technology as well as strategies to include more stakeholders in future equipage. In addition, industry and the FAA will work together to promote the use of Data Comm services across as many aircraft types beyond the incentivized equipage program with the joint goal of ensuring the benefits of Data Comm services are realized across the operation for all stakeholders and users of the NAS. The recommendations include establishing fleet equipage targets for Calendar Year 2023 to support follow-on capabilities that target 40% of NAS operations as well as includes developing a strategy for regional jet equipage and for regional jets to participate in and receive benefits from Data Comm services.

Multiple Runway Operations has repeatedly delivered benefits to industry thru procedural innovations and changes without equipage costs to industry stakeholders. In the past, Wake Recategorization 1.5 and 2.0 were successfully deployed across the NAS at 17 Terminal Radar Approach Control (TRACON) facilities and 31 airport locations. The FAA estimates Wake RECAT has saved airlines more than $70 million, extrapolating from the joint analyses team methodology.

The FAA introduced the new consolidated wake turbulence concept that optimizes the best from numerous wake recat procedures into one standard to safely further reduce separation standards that can deployed to any location across the NAS. Moreover, the agency rapidly deployed this capability in 2018 and committed to expanding the procedures to numerous locations across the NAS. Industry commits to examine the benefits of this new concept. The plan identifies other areas for analysis to further evolve procedures that increase throughput by continuing to improve parallel runway operations, closely spaced parallel operations arrivals and departures, and the use of dynamic wake turbulence concepts that factor in wind speed. Finally, the NIWG commits to work together with the joint partners to raise awareness across the NAS on wake turbulence encounters.

The Performance Based Navigation implementation recommendations are built upon the 2016 PBN NAS Navigation Strategy that leverages past successes and builds a compelling future based on aligning 1) aircraft equipage, 2) ground technology/tools and 3) procedures. Aligning these three key elements are the basis for successful activities identified to advance PBN. In past commitments, Metroplex projects have shown to improve operations at some locations.

The plan includes 4 major FAA Metroplex projects (CLE/DTW, DEN, LAS and FL) at numerous major airport locations in the NAS in this report. PBN is a key element of the FAA's trajectory based operations concept to optimize the NAS using time-based management. This report identifies select FAA initial trajectory based operations capabilities to implement across 3 locations in the Northeast Corridor, Denver, and Atlanta. Critical to this plan is a recommendation to develop a multi-year capital implementation plan for PBN that serves as a roadmap for the completion of the 2016 NAS NAV Strategy. It cannot go without noting, consistent and sustainable funding for PBN implementation is needed to achieve the scale of effort needed in this report. Finally, this report identifies recommendations in Ground Based Augmentation System, Advanced Required Navigation Performance, Established on RNP and others that highlight industry capabilities that the FAA can leverage to improve efficiencies in the NAS.

The Surface and Data Sharing initiatives are gaining ground by connecting industry operators to the system wide information management system (SWIM). Fundamental to progress in this area, is the formation of the SWIM Industry-FAA team (SWIFT). This community forum acts as a single environment for collaborative communication and engagement around information and data sharing with the FAA. Data sharing is foundational for traffic flow management (TFM) decision support tools and the TBO concept.

Another key effort for the NIWG Surface and data sharing group is the NAS implementation of the Terminal Flight Data Manager (TFDM) program. TFDM requires critical operator data to integrate arrival, departure and surface operations to meter and deliver time and fuel savings to operators. These areas, along with Collaborative Decision Making (CDM) Steering Group (CSG) activities, support continuity and connectivity with the Surface Collaborative Decision Making (S-CDM) Concept of Operations, and seek to further enhance data exchange between FAA and all aviation stakeholders. FAA and Industry team's partnership with NASA on a surface departure metering capability for integrated arrival/departure/surface work provides valuable lessons learned with the capability already being demonstrated at Charlotte.

The group remains focused on advancing data driven traffic flow management (TFM) across the NAS with an emphasis on the data and connectivity requirements for current and future NAS automation systems.

Specific Recommendations by NextGen Focus Areas

Data Comm - Controller Pilot Data Link Communications (CPDLC)

Background/Introduction

In 2014, the NextGen Advisory Committee (NAC) approved the NextGen Integration Working Group (NIWG) final report and the NextGen Priorities Joint Implementation Plan was presented to Congress. In 2016, the NAC continued the effort and delivered a follow-on Rolling Plan to Congress. Collectively Data Comm have achieved many successes in meeting implementation milestones for fielding NextGen capabilities, advancing work in the four priority areas of Data Comm, Multiple Runway Operations (MRO), Performance Based Navigation (PBN), and Surface Operations.

- Data Comm – In response to NAC recommendations, the FAA deployed Controller Pilot Data Link Communications (CPDLC) Departure Clearance (DCL) Tower Services to all planned airports, well in advance of all planned implementation dates. Furthermore, The NAC Joint Analysis team (JAT) validated the program benefits and metrics confirming that Data Comm is delivering benefits to the NAS. Data Comm is preparing for the implementation of the En Route Initial Services phase of the program, to include completing the necessary transition to National Single Data Authority (NSDA), and conducting risk reduction events in Kansas City (ZKC) airspace, a key site. The program also successfully obtained a Final Investment Decision (FID) for En Route Full Services, to be implemented starting in 2022.

Summary

Evolving the National Airspace System (NAS) to meet the goals of NextGen requires the implementation of advanced data communications between flight crews and air traffic controllers. Continuous communication among controllers and pilots is essential to safely coordinate the thousands of airplanes in the NAS at any given time. As the NAS moves to a time-based flow management system, it will become increasingly critical to have the capability to provide En Route data communications between the flight deck and the controllers. In the future, controllers and pilots communicating verbally using analog radios may detract from technologies that enable the implementation of increasingly complex NextGen capabilities. Voice communication is labor intensive, time consuming, has a propensity for miscommunication and human error, and limits the ability of the NAS to meet future traffic demand. The program also provides an interface to the aircraft operator dispatch function, increasing operational efficiency. The investment in data communications is critical to enhancing the NAS and modernizing air traffic operations.

In an effort to ensure that Data Comm capabilities are delivered and the benefits are realized, the Data Comm NextGen Integration Working Group (NIWG) thoroughly reviewed the FAA Data Comm Program and developed timelines, locations, and services to which both industry and the FAA would commit. To that end, the Data Comm NIWG specifically reviewed nine areas for this rolling plan update. These areas are as follows:

- Reviewed progress of operator equipage progress and recommendations for future equipage
- Reviewed and confirmed the deployment of Data Comm Tower Services to the identified additional seven towers

- Reviewed and confirmed the implementation strategy for Data Comm En Route Initial Services
- Reviewed the development and implementation planning of En Route Full Services
- Reviewed the development of a baseline for the deferred En Route Full Services and identification of enhanced services beyond En Route Full Services utilizing the FANS 1/A message set
- Reviewed the resolution of avionics interoperability concerns, to include the interoperability issues regarding Pegasus 1 avionics
- Reviewed the development of a loadability solution for Runway SID/STARs
- Reviewed the development of a solution for full automation for the confirm assigned route capability
- Reviewed the examination of opportunities to promote efficiencies by integrating Data Comm with other NextGen NIWG capabilities

Operators continue to equip with VHF Digital Link Mode 2 (VDL Mode2) and FANS 1/A avionics and software. Over 1,900 aircraft have already been equipped through the Data Comm Program equipage initiative.

Based on the success of the Tower Services deployed in 2015-2016, the group confirmed its commitment to supporting the implementation of En Route Initial Services in 2018-2019, as well as deployment of Tower Services to the additional towers previously identified by the NIWG. The group recommends the FAA continue to explore deploying Data Comm Tower Services to additional towers and in other En Route airspace in the NAS (e.g., Anchorage, Honolulu, etc.). There is a solid operational and benefits case to deploy Data Comm at Anchorage and Honolulu. However, there are infrastructure and technical limitations at these locations that will need to be addressed in the future to allow these capabilities to be expanded. The group continues its endorsement of the planned En Route Initial Services implementation strategy and waterfall. The group recommends NAS-wide implementation of En Route Initial Services within a one-year timeframe to avoid safety concerns and user acceptability issues associated with a prolonged rollout.

The capabilities in En Route Initial Services will deliver significant benefits to the NAS and are eagerly anticipated by the operator community. The En Route Initial services implementation plan was developed in conjunction with all stakeholders to ensure a smooth transition of these capabilities into NAS operations. The Data Comm NIWG supports the implementation of Data Comm En Route Initial Services to all 20 Air Route Traffic Control Centers (ARTCC) over a one-year period.

The Data Comm NIWG notes that En Route Full Services in their entirety were rated a Tier 1 capability in the initial NAC report. The limitation of funding and the subsequent need to break En Route Full Services will delay the realization of delivery of operational benefits and efficiencies. The Data Comm NIWG recommends that En Route Full Services, a 2014 Tier 1 priority by the NAC, be implemented as soon as possible, and that the FAA investigate acceleration of the deployment ahead of the scheduled IOC in 2022. En Route Full Services includes the previously baselined capabilities: Controller Initiated Re-routes (Full Capability), Direct-to-Fix Messages (Full Capability), Crossing Restrictions (Full Capability, Advisory Messages, and Holding Instructions.

Additionally, The Data Comm NIWG recommends the previously deferred capabilities from Full Services be implemented in the Full Services timeframe. The deferred services to be implemented would include Adapted Arrivals, Speeds (Full Capability), Stuck Microphone, and Beacon Codes. Furthermore, the Data Comm NIWG recommends the FAA investigate including enhanced services in this implementation that can be delivered using the FANS 1/A message set, such as complex re-routes with time, speed and altitude elements, TMC-initiated re-routes, and initial aircraft intent.

The Data Comm NIWG supports the temporary ground system mitigation developed to allow 757 and 767 aircraft using the Pegasus 1 Flight Management System (FMS) to participate in En Route Initial Services. However, this is not a permanent solution and an avionics solution needs to be developed prior to the end of 2021 to allow the 757 and 767 aircraft to continue to receive Data Comm En Route Services.

The Data Comm NIWG recommends as part of FAA tower automation enhancements, that the FAA include the capability to uplink all loadable route clearance elements including runway in the full services timeframe (2022). During the early design phase of Data Comm, it was identified that CPDLC services were limited to the information available in the automation systems delivering the clearance. One such example is the tower data link system does not have the complete information to provide the runway element as part of the uplinked, loadable departure clearance. This data element shortcoming is due to a lack of FAA tower automation capability. One of the primary goals of the Data Comm Implementation Team (DCIT) is to implement CPLDC messages to maximize existing flight deck automation using loadable messages. Reducing the human in the loop dependency by enabling flight deck automation for services such as complex route changes exemplifies the major benefits of Data Comm.

The Data Comm NIWG recommends the full automation of the Confirm Assigned Route function be implemented in the Full Services timeframe. When a re-route is issued, the flight crew follows up by sending the entire active route loaded in the FMC back to the controller. ERAM could be programmed, as it is in Nav Canada and NATS, to evaluate the response and only notify the controller/pilot if the assigned route does not match the Confirm Assigned Route. Today we are expecting the controller to manually go through the Confirm Assigned Route looking for errors. One of the major benefits of Data Comm is the automation's capability to reduce human error.

The Data Comm NIWG recognizes that there are synergies and efficiencies to be gained by integrating NextGen capabilities to deliver holistic benefits that would not be possible with a single capability. The Data Comm NIWG recommends the aviation community continue to identify capabilities to be integrated together that will produce increased operational efficiencies, to include the examination of opportunities to promote efficiencies by integrating Data Comm with other NextGen NIWG capabilities (i.e., Surface, PBN, and NEC).

In summary, the Data Comm NIWG endorses the following:

- The continued commitment for the airlines to equip at least 1,900 aircraft for Data Comm by FY 2019
- The development of target FANS 1/A avionics equipage rates to support follow-on capabilities
- The development of an avionics equipage strategy for regional jets to participate in and receive benefits from Data Comm services
- The continued of deployment of Data Comm Tower Services to seven additional towers: Andrews (ADW), Buffalo (BUF), Charleston (CHS), Columbus (CMH), Fort Myers (RSW), Reno (RNO), and Van Nuys (VNY)
- The investigation of deployment of Data Comm Tower Services to additional towers and in other En Route airspace in the NAS (e.g., Anchorage, Honolulu, etc.)
- The deployment of Data Comm En Route Initial Services to all 20 CONUS ARTCCs in accordance with the agreed to government and industry schedule

    - To avoid safety concerns and user acceptability issues associated with a prolonged deployment the group recommends full implementation of En Route Initial Services within a one-year timeframe
- The continued development and implementation of En Route Full Services
    - The industry members of the Data Comm NIWG recommend the FAA fully fund En Route Full Services
- The development of a baseline and identification of enhanced services utilizing the FANS 1/A message set by Q3 CY2021
- The inclusion of the previously deferred capabilities from Full Services to be implemented in the Full Services timeframe
- The investigation of additional capabilities in the Full Services implementation
- The resolution of avionics interoperability concerns, to include the interoperability issues regarding Pegasus 1 avionics
- The development of a loadability solution for Runway SID/STARs
- The development of a solution for full automation for the confirmed assigned route capability
- The examination of opportunities to promote efficiencies by integrating Data Comm with other NextGen NIWG capabilities

Background

The Data Comm Program will provide data communications services between pilots and air traffic controllers as well as enhanced Air Traffic Control (ATC) information to airline operations centers and other flight following providers. Data Comm will provide a data interface between ground automation and the flight deck for controller and pilot communications, allowing pilots and controllers with a push of a button to send, accept, and insert (if allowed) into flight deck avionics safety-of-flight ATC clearances, instructions, traffic flow management notices, flight crew requests and reports. Data Comm is critical to the success of NextGen, enabling efficiencies not possible with the current voice system.

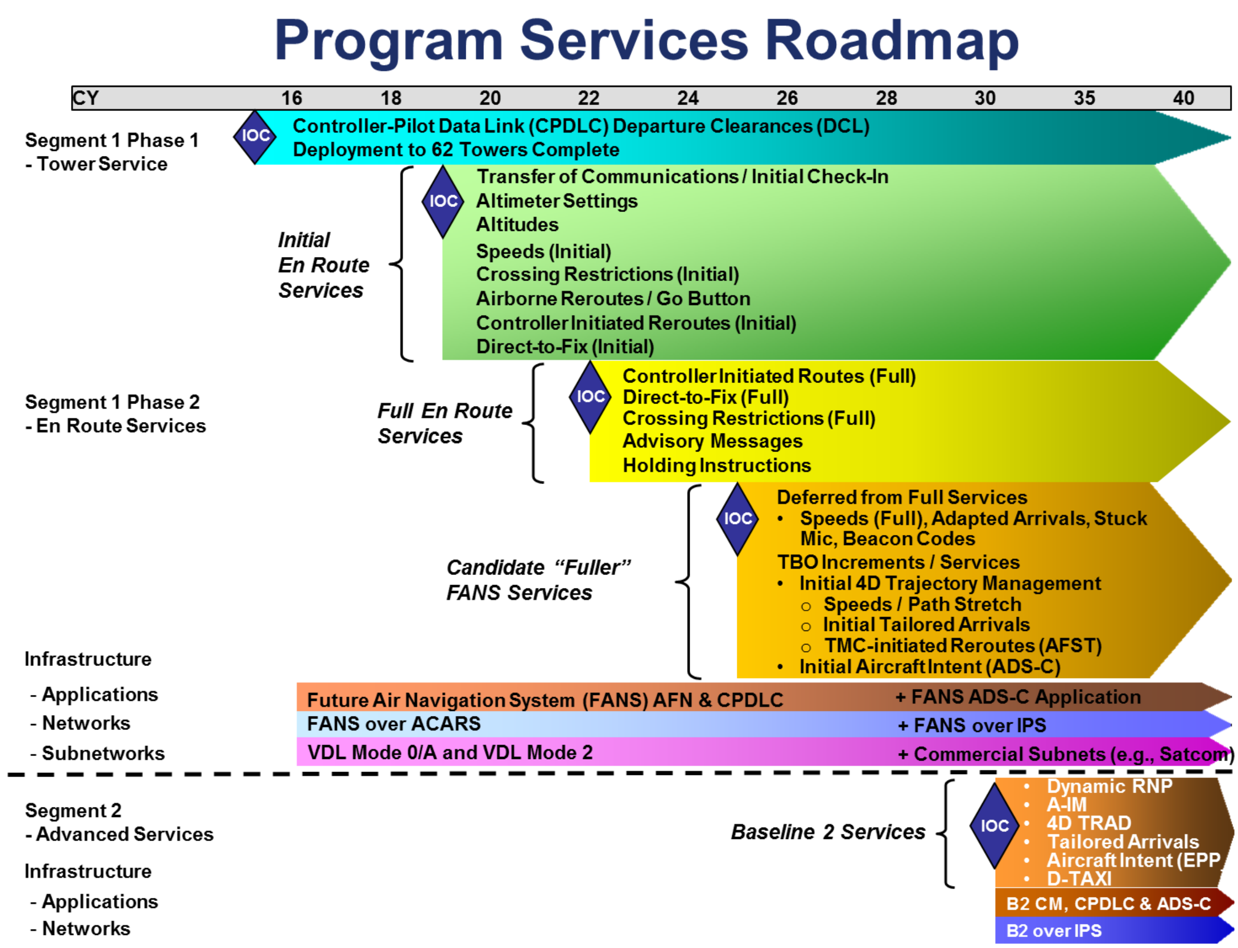
The operational benefits of the Data Comm Program are:

- Enhanced safety by reduced communication errors,
- Reduced communication time between controllers and pilots,
- Increased airspace capacity and efficiency,
- Reduced delays, fuel burn, and carbon emissions,
- Improved re-routing around weather and congestion,
- Increased flexibility and accommodation of user requests,
- Enables NextGen services, such as enhanced re-routes, trajectory operations,
- Enables the communication of complex clearances that can be efficiently executed,
- Ability to do post operational data mining of route changes to improve flight planning,
- Improved situational awareness and reduced time for route clearance acceptance through improved integration of dispatch.

These improvements to the NAS will be realized through the execution of the Data Comm Program in two primary segments. Segment 1 will deliver the initial set of Data Comm services integrated with ground automation support tools in designated ATC Towers (Segment 1 Phase 1), followed by deployment of En Route Services (Segment 1 Phase 2). Segment 2 will further build upon the Tower and En Route services by supporting more advanced NextGen capabilities not possible using voice, such as Dynamic Required Navigation Performance (DRNP), Advanced Interval Management, 4-D Trajectories, and D-TAXI. These advanced services will require the deployment of Baseline 2 avionics. Since Baseline 2 avionics are now not expected to be widely deployed in the NAS until the 2030s, the planned date for the deployment of Baseline 2 infrastructure and applications is now expected to be in the 2030+ timeframe. To bridge the gap until Baseline 2 can be deployed, Data Comm will explore capabilities that can be provided using the current message sets (i.e., FANS 1/A). Although this phase is still in the planning stages, the candidate capabilities to be implemented to bridge the gap are shown in the orange arrow in Figure 1 below and are expected to be available in approximately 2025. The focus of the activities of this working group is on Segment 1 Phases 2 En Route Initial, Full, and Enhanced Services utilizing Future Air Navigation System (FANS) 1/A avionics.

The Data Comm services phasing strategy for the program is shown graphically below in Figure 1. Segment 1 Phase 1 is Tower Services providing Controller Pilot Data Link Communications (CPDLC) Departure Clearances (DCL) and was baselined in May 2012. Segment 1 Phase 2 is CPDLC En Route Service which will be deployed in three increments. En Route Initial Services were baselined in October 2014. A portion of En Route Full Services consisting of Controller Initiated Routes (Full Capability), Direct-to-Fix (Full Capability), Crossing Restrictions (Full Capability), advisory messages and holding instructions were baselined in August 2016. The remaining En Route Full Services consisting of Speeds (Full Capability), Stuck Microphone, Adapted Arrivals and Beacon Codes, along with other enhanced services, have a projected baseline date of Q3 CY2021.

Figure 1. Data Comm Services Strategy



Departure Clearances (DCL) – Segment 1 Phase 1 (S1P1) (Baselined in May 2012)

In S1P1, the Data Comm Program delivered CPDLC DCL to airports including revisions with full route clearances transmitted directly to the aircraft on the airport surface. Route revisions can be loaded directly into aircraft avionics by the pilots. The Data Comm Program implemented CPDLC DCL Services in accordance with the accelerated timeline requested in the 2014 NIWG report, and is currently fully operational in the NAS. CPDLC DCL services expedite the delivery of departure clearances to aircraft, streamline clearance delivery operations and enable quicker recovery from changes in the operational configuration of runways and airspace caused by weather and other events. CPDLC DCL improves efficiency, reduces ground delays, and results in more effective tactical management of NAS resources.

The major elements of Segment 1 Phase 1 are:

- Tower Data Link Services (TDLS) software and hardware enhancements to legacy Pre-Departure Clearances (PDC) functionality to enable Departure Clearance (DCL) services in the Towers.
- En Route Automation Modernization (ERAM) software and hardware enhancements to include logon and session establishment.
- Data Communications Network Service (DCNS) which will provide the air/ground communications network services infrastructure.
- Avionics Equipage Initiative which will provide incentives for operators to equip aircraft with FANS 1/A avionics and VHF Data Link (VDL) Mode 2 radios.

En Route Initial Services – Segment 1 Phase 2 (S1P2) (Baselined in October 2014)
S1P2 En Route Initial Services will leverage the S1P1 infrastructure to deliver services to the En Route domain using CPDLC. En Route Initial Services will include airborne re-routes, altitude and speed assignments, altimeter settings, crossing restrictions, and will automate routine communications such as transfer of communications and initial check-in. Controller initiated re-routes include limited functionality for pilot requested re-routes. The Data Comm En Route Initial Services will contribute to a reduction in flight delays, more efficient routes for aircraft resulting in increased operational efficiency, and enhanced safety all while reducing operational costs for airspace users. As Data Comm becomes fully operational, the majority of pilot-controller exchanges will be handled by Data Comm for Data Comm equipped operators.

The major elements of the En Route Initial Services Segment 1 Phase 2 implementation are:

- ERAM software enhancements for En Route CPDLC applications.
- DCNS expanded coverage and capacity

En Route Full Services – Segment 1 Phase 2 (S1P2) (Baselined in August 2016)
S1P2 En Route Full Services will further leverage the S1P1 infrastructure to deliver additional services to the En Route domain, to include additional CPDLC messages and expanded re-route capabilities. The En Route Full Services will be delivered in two stages. The S1P2 En Route Full Services will include expanded controller and pilot initiated downlinks, direct-to-fix messages, issuing of crossing restrictions, holding restrictions and will automate some routine communications such as advisory messages. The Data Comm En Route Full Services will contribute to a reduction in flight delays, more efficient routes for aircraft resulting in increased operational efficiency, and enhanced safety all while reducing operational costs for airspace users. The addition of Full Services will result in more pilot-controller exchanges being handled by Data Comm for equipped operators.

The FY19 President's Budget Request includes no funding for En Route Full Services. The program has delivered Data Comm to 61 airports over two years ahead of schedule, is widely supported by the airspace users, and is on track to deliver En Route Initial Services starting in late 2018. The decision to eliminate funding for En Route Full Services was due to overall funding constraints. Data Comm has strong industry backing and regularly meets with airspace users ensure the program capabilities and services are aligned with industry plans. This collaboration creates a tremendous amount of forward momentum and cooperation. Restoring the baselined FY19 funding for Data Comm En Route Full Services ensures this momentum between the FAA and airspace users continues and does not jeopardize the airspace user's business case to invest in Data Comm avionics equipage, operations, and pilot training. Entities affected by this deferral in Data Comm En Route capability include airline end users, such as Alaska Airlines, American Airlines, Delta Air Lines, FedEx Express, Hawaiian Airlines, JetBlue Airlines, Southwest Airlines, United Airlines, and UPS, 45 international airlines, hundreds of business aviation users, as well as FAA contractors Harris Corporation and Leidos.

The major element of the En Route Full Services Segment 1 Phase 2 implementation is:

- ERAM software enhancements for En Route CPDLC applications.

Enhanced En Route Services (Not Baselined)
A subsequent stage of En Route Full Services will include Adapted Arrivals, Beacon Codes, Speeds (Full Capability), Stuck Microphone, Initial 4-D Trajectory Management, Path Stretch, Initial Tailored Arrivals, TMC Initiated Re-routes, and Initial Aircraft Intent (ADS-C). Adapted Arrivals, Beacon Codes, Speeds (Full Capability), and Stuck Microphone functionalities were removed from the first stage of the En Route Full Services and placed into this second stage as a result of FAA budget constraints. The airline industry believes the capability for a controller to provide altitude and airspeed constrains on a re-route would be a valuable first step in the development of a truly dynamic tailored arrival and optimized profile descent (OPD) which is a desire of both the FAA and industry. This would also be an important element to enable complex path-stretches off OPDs for time based flow management into the terminal area. The Data Comm NIWG also recommends investigating the feasibility of enhanced services using the current FANS 1/A message set. Such candidate enhanced services include complex re-routes with time, speed, and altitude elements; TMC initiated re-routes, and ADS-C initial aircraft intent. The Data Comm NIWG recommends the FAA baseline these deferred and additional En Route Services by end of Q3 CY2021. Once these services are identified and baselined, the Data Comm NIWG recommends fully funding this effort.

Data Comm Benefits and Metrics

The Data Comm NIWG reviewed and validated the FAA strategy for delivery of Data Comm capabilities to the NAS, for both Segment 1 Phase 1 (S1P1) and Segment 1 Phase 2 (S1P2). The group also agreed with the qualitative benefits expected for both S1P1 and S1P2, as well as identifying categories of metrics to be tracked to measure program success.

Expected Benefits
Data Comm will revolutionize ATC communication between the ground and the cockpit, increasing the capacity, flexibility, and productivity of the NAS. Data Comm provides services which will enhance safety, airspace throughput, flight times, reduce carbon emissions, reduce fuel usage, and other efficiencies in both the Terminal and En Route environments. It will reduce air traffic control communications workload which will reduce air traffic delay and increase efficiency through an increase in controller flexibility. Data Comm will allow complex routing communications that will make better use of available NAS resources such as airspace and airports. This improvement will occur for routine operations and be even more critical during system disruptions such as weather. Data Comm is a key transformational program under NextGen that will enable advanced capabilities, such as Trajectory Based Operations, Advanced Flight Interval Management, Enhanced Surface Movement, and Dynamic RNP. Data Comm will also reduce operational errors, enhancing the safety and efficiency of the NAS.

One significant example of benefits available to the airspace users in En Route Full Services is the ability for flight crews to request a new route during flight. Airlines have preferred routes around weather or to take advantage of favorable wind conditions, sometimes these routes are not available at departure, but open up during flight. Today requesting a new route is a cumbersome and time-consuming process with voice communications, quite often these requests are denied due to the time it takes to communicate, de-conflict, and clear the request from the flight crew. In En Route Full Services, the data link capability allows flight crews to request a more efficient route by electronically sending their preferred route to air traffic control. This capability enables pilots to quickly and seamlessly share their preferred route with an air traffic controller, giving them the same picture. If the route request does not pose a conflict, the controller can then send a revised route clearance back to the flight crew, quickly enabling them to program and execute their preferred route. The airlines anticipate this capability will enable them to fly more efficient routes, saving time and fuel. The airspace users have expressed through the NextGen Advisory Committee (NAC) and other forums that their business case for investing in Data Comm relies on the capabilities delivered by En Route Full Services.

DCL Services at the Tower (S1P1) improves operations in the following manner:

- Improve communication accuracy and safety with digital communication (i.e., reduced read/hear back errors, reduced loss of communications events).
- Improve recovery from service disruptions, mitigate propagated delay, improve schedule reliability, and enable NextGen capabilities.
- Improve controller efficiency.
- Reduce environmental impact due to less fuel burn and emissions.
- Direct cost savings for both the FAA and operators from reduced delay enabled by a reduction in communication time for revised departure clearances and enhanced aircrew coordination with company dispatch.
- Enable post operational data analytics of clearances that are revised from the filed flight plan.

CPDLC Services in En Route (S1P2) will improve operations in the following manner:

- Improve communication accuracy and safety with digital communication (i.e., reduced read/hear back errors, reduced loss of communications events).
- Improve controller and flight crew efficiency by providing automated information exchange.
- Improve rerouting capabilities.
- Allow more efficient routes for aircraft.
- Decrease congestion on voice channels and provide an alternative communications capability.
- Improve NAS capacity and reduced delays associated with congestion and weather.
- Reduce environmental impact due to less fuel burn and emissions.
- Direct cost savings for both the FAA and operators from increased throughput/efficiency realized through reduced delays and improved communications.
- Direct cost savings for both the FAA and operators from reduced distance flown enabled by more precise airborne re-routes.
- Enable post operational data analytics of crossing restrictions, climb/descent requests, holding instructions, and re-routes after take-off to improve flight planning.

The FAA's business case indicates that the S1P1 and S1P2 services to be provided by Data Comm are conservatively estimated to save operators more than $10 billion over the 30-year lifecycle of the program and save the FAA approximately $1 billion in operating costs.

Metrics

The working group recommended the following operational metrics for the program:

Metrics for DCL Services at the Tower (S1P1)

- Data Comm Usage - This category of metric tracks whether the system is being used operationally and therefore whether the system and procedures are operationally suitable and performing as designed.
- Minutes of Comm Time Saved - This category of metric tracks how many controller/pilot communications minutes have been saved by the implemented Data Comm functions. The metric is broadly covered by comparing known voice communication times with the communication times observed during Data Comm exchanges.
- Ground Delays - This category of metric tracks the impact on taxi time changes, on taxi-time variability, and airport recovery which translates into schedule predictability for aircraft operators.
- Airspace Throughput - This category of metric tracks the impact on sector throughput for both routine operations and weather or other disruption events.
- Efficiency - This category of metric tracks the impact on more efficient routes.
- Fuel Burn - This category of metric tracks the impact on the amount of fuel burned.
- Implementation - Industry will jointly track with the FAA the operational milestones published by the program.

Metrics for CPDLC Services in En Route (S1P2)

- Data Comm Usage - This category of metric tracks whether the system is being used operationally and therefore whether the system and procedures are operationally suitable and performing as designed.
- Minutes of Comm Time Saved - This category of metric tracks how many controller/pilot communications minutes have been saved by the implemented Data Comm functions. The metric is measured by comparing known voice communication times with the communication times observed during Data Comm exchanges.
- Improved controller and flight crew efficiency providing reductions in fuel burn, carbon emissions, and flight time through an increase in the most optimum re-routes during a disruption event.
- Airspace Throughput - This category of metric tracks the impact on sector throughput for both routine operations and weather or other disruption events.
- Efficiency - This category of metric tracks the impact on more efficient routes.
- More efficient re-routes (weather and general) – Increased time saved through decreased approval/acceptance time for re-routes, more efficient re-routes through increased use of auxiliary waypoints (HAR, PBD, lat/long), and increased acceptance/approval of weather re-routes before the re-route benefits opportunity window closes.
- Fuel Burn (for the purposes of evaluating Data Comm) - This category of metric tracks the impact on the amount of fuel burned during En Route phase of flight.
- Ability to do post operational data analytics of crossing restrictions, climb/descent requests, holding instructions, and re-routes after take-off to improve flight planning.
- Implementation - Industry will jointly track with the FAA the operational milestones published by the program.

Implementation Plan

The Data Comm Program implemented S1P1 CPDLC DCL Service in 2016, in accordance with the NAC recommended schedule. Following up on a NAC recommendation, the program is in the process of implementing the CPDLC DCL service at an additional seven sites. These additional sites will be operational by the end of 2019.

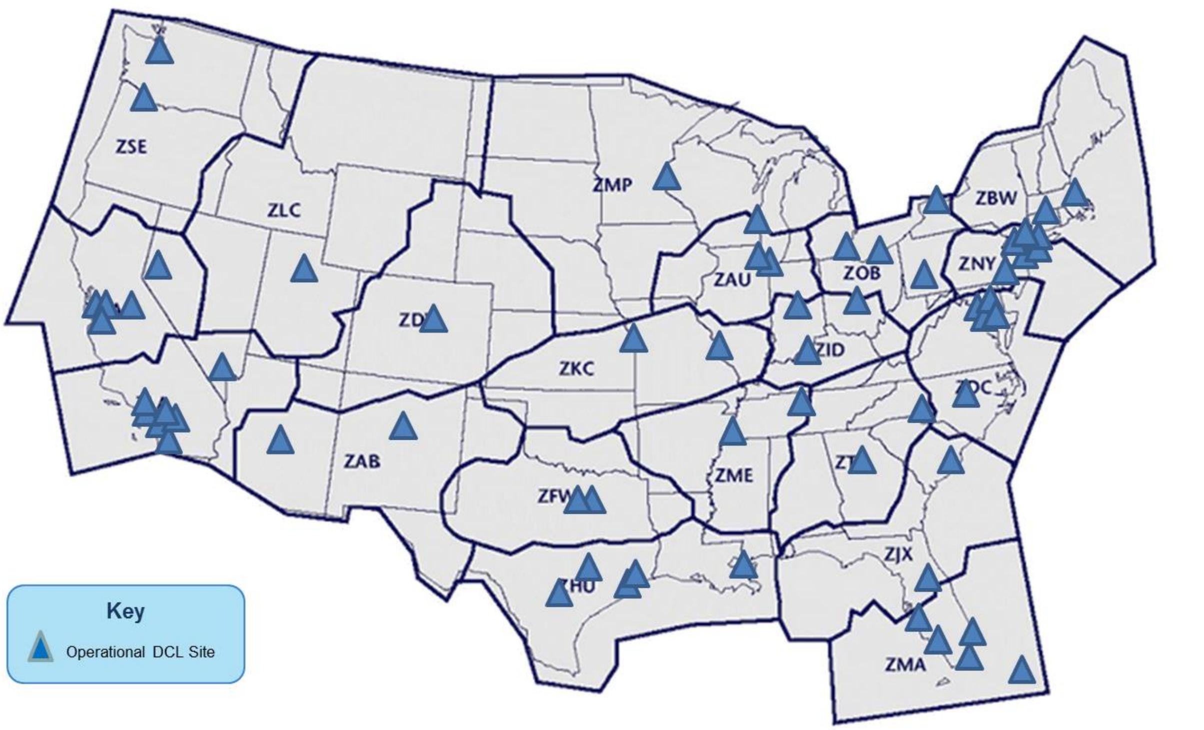
The Data Comm Program is also baselined for cost, schedule, and technical requirements to deliver the S1P2 En Route Initial Services. This plan includes schedule milestones and metrics to ensure the program is delivering its capabilities on time. The program has developed and coordinated the plan for implementation of En Route Initial Services to all 20 ARTCCs.

The program has also developed a plan, schedule, and budget to deliver S1P2 En Route Full Services to include controller and pilot initiated downlinks, direct-to-fix messages, crossing restrictions, holding restrictions and advisory messages. The FAA baselined this stage of the program in August 2016. The program is also developing a plan, schedule, and budget to deliver the remaining S1P2 En Route Full Services to include Adapted Arrivals, Beacon Codes, Speeds (Full Capability), Stuck Microphone, Initial 4-D Trajectory Management, Path Stretch, Initial Tailored Arrivals, TMC Initiated Re-routes, and Initial Aircraft Intent (ADS-C). The baselining date for this stage of the program is yet to be determined. The Data Comm NIWG recommends baselining this stage by the end of Q3 CY2021.

Implementation Locations

The CPDLC DCL service was implemented at the Tower Data Link Services (TDLS) airports, shown in blue in Figure 2. The CPDLC DCL service will be deployed to an additional seven airports by the end of 2019, shown in yellow in Figure 2.

Figure 2. Data Comm Tower Implementation Sites



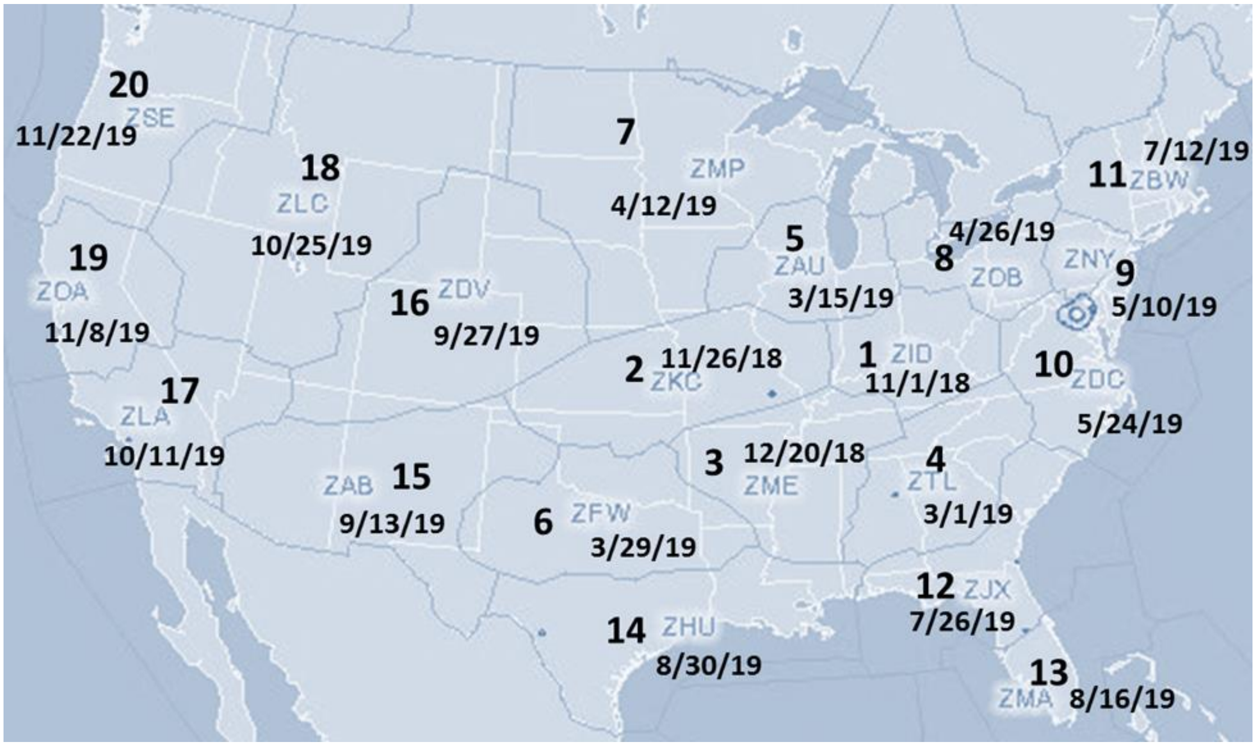
En Route Services – S1P2

En Route Initial Services has been baselined to deliver services beginning in 2019. The FAA is pursuing a schedule to start implementation of En Route Initial Services in 2018, and the Data Comm NIWG supports this schedule. The implementation strategy is shown below in Figure 3. En Route Initial Services will consist of the following CPDLC services:

- Transfer of Communications
- Initial Check-In
- Altimeter Settings
- Altitudes
- Airborne Re-routes/Go Button
- Controller Initiated Routes (Initial)
- Direct-to-Fix (Initial)
- Crossing Restrictions (Initial)
- Speeds (Initial)

The CPDLC services and airborne re-routes will be implemented in the En Route airspace in all 20 CONUS ARTCCs. The En Route initial services will be delivered in the sequence shown below in Figure 3.

Figure 3. Data Comm En Route Initial Services Implementation Waterfall



The En Route Full Services are planned to be delivered beginning in 2022, and will consist of the following CPDLC services:

- Holding Instructions
- Advisory Messages
- Controller Initiated Routes (Full Capability)
- Direct-to-Fix (Full Capability)
- Crossing Restrictions (Full Capability)

Due to budget constraints, the remaining En Route Full Services have been deferred to a future second stage. This stage is planned to be baselined in Q3 CY2021. The following services were deferred:

- Adapted Arrivals
- Speeds (Full Capability)
- Beacon Codes
- Stuck Microphone

The program also plans to implement additional services leveraging the FANS 1/A avionics set when these deferred services are implemented. These additional services are:

- Initial 4D Trajectory Management
- Path Stretch
- Initial Tailored Arrivals
- TMC-initiated Re-routes (AFST)
- Initial Aircraft Intent (ADS-C)

Implementation Activities

In order to implement the Data Comm En Route services into the NAS both the FAA and industry will be required to complete a variety of activities. Some of these activities are national activities to be completed centrally, whereas some activities will be completed at the specific ARTCC sites. These activities will require close coordination between FAA and industry to successfully deliver the Data Comm capabilities to the NAS.

FAA Activities

The FAA will leverage the S1P1 infrastructure to deliver the S1P2 services to the En Route domain. The program will make the necessary enhancements to the TDLS and ERAM software to deliver the expanded capabilities. Additional DCNS and FTI services will be provided to encompass the En Route airspace. S1P2 will continue to leverage FANS 1/A/VDL avionics. The FAA will also conduct the additional required training for controllers and technicians on the additional services.

S1P2 will be comprised primarily of software capability enhancements to TDLS and ERAM. The majority of the infrastructure required for S1P2 services in the En Route domain will have been delivered in the S1P1 phase of the program. However, the FAA will need to conduct additional required training for controllers and technicians on the additional services, in addition to amending appropriate procedures.

The FAA and operators will work closely together during site test and rollout activities. For transition to En Route operations in the NAS to be a success, industry and the operators commit to provide support to FAA sites and operational acceptability test activities. In order for testing to occur, operators need to provide equipped aircraft, trained crews, and dispatch support for key site testing starting in 2018.

S1P2 En Route Initial Services were baselined for cost, schedule and technical requirements at a Final Investment Decision (FID) in Q4 CY 2014. A subset of S1P2 En Route Full Services consisting of Controller Initiated Routes (Full Capability), Direct-to-Fix Messages (Full Capability), Crossing Restrictions (Full Capability), Advisory Messages, and Holding Instructions were baselined for cost, schedule, and technical at an FID in Q3 CY 2016. The deferred S1P2 En Route Full Services, including Speeds (Full Capability), Adapted Arrivals, Stuck Microphone, and Beacon Codes, Initial 4D Trajectory Management, Path Stretch, Initial Tailored Arrivals, TMC-Initiated Re-routes (AFST), and Initial Aircraft Intent (ADS-C) are planned to be baselined at an FID in Q3 CY2021.

Aircraft Operator Activities

In order for controllers to maintain familiarity with CPDLC operations and realize the full Data Comm benefits the FAA estimates at least 1,900 aircraft will need to be equipped with FANS 1/A and VDL Mode 2 avionics. Eight air carriers have signed Memorandums of Agreement (MOAs) to participate in the Data Comm Avionics Incentive Initiative, which when fully executed will provide 1900+ certified and equipped aircraft into the fleet. No additional avionics are required to receive S1P2 En Route services to fully participate in S1P2.

Close coordination will be required between the FAA and operators for delivering the service to the site; therefore, required operator's activities are integrated into the En Route implementation plan. These activities specifically include operator filing of Ops Spec A056, pilot training, support for test and integration, and operations center interoperability testing and software support.

Other Considerations

The NIWG reviewed the FAA's program strategy focusing on functional capabilities, implementation locations and timelines, and operational considerations. The following sections include areas of consideration the NIWG has identified as significant for the successful implementation of the Data Comm capabilities:

Data Comm Equipage

Operator Equipage Commitment (VDL Mode 2/FANS 1/A):

The FAA established a Data Comm equipage incentive program to encourage early adopters and to help achieve a goal for the program of 1900+ aircraft equipped with VHF Digital Link Mode 2 (VDL Mode 2) and FANS 1/A avionics and software by 2019. These funds are part of the Data Comm program baseline. The 1900+ aircraft goal was based upon creating enough daily operations to produce a "tipping point" of Data Comm benefits to the operation and safety of the National Airspace System and to the operators.

The operators are currently executing against MOA commitments for equipping and fully expect to have enough daily operations to produce the expected Data Comm benefits within the NAS.

Additionally, the Data Comm Program has developed a framework to allow FANS 1/A over media other than VDL Mode 2 for Tower and En Route Services. It is projected that over 400 aircraft utilize FANS 1/A over VDL Mode 0 for CPDLC DCL, but will be restricted from En Route services. These aircraft are not incentivized via the Data Comm incentive initiative but add to the number of CPDLC DCL operations per airport per day. The operators are working with their applicable Communications Service Providers (CSP) to identify opportunities for these aircraft to participate in En Route CPDLC.

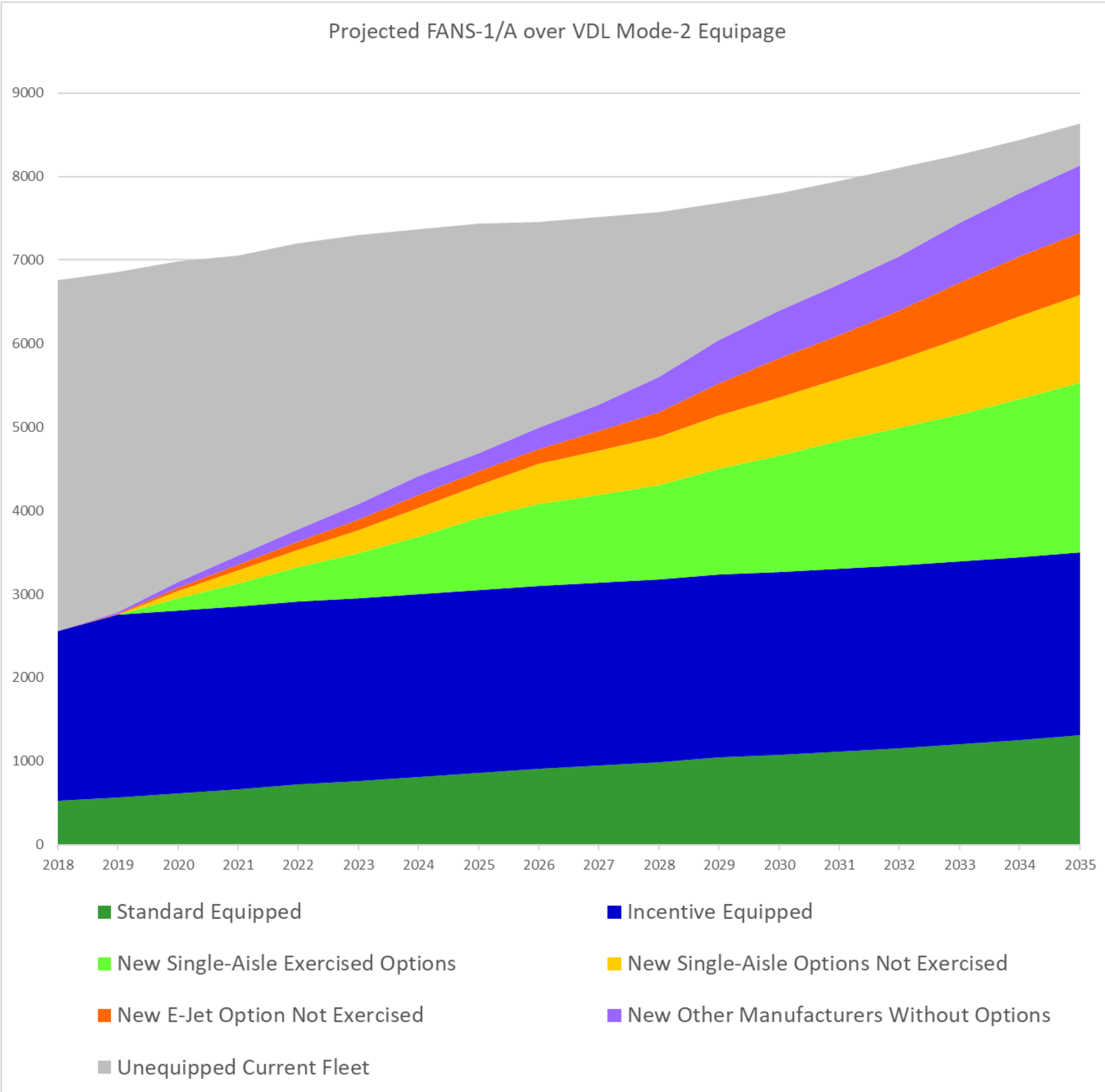
In order for the Data Comm program to be successful, industry stakeholders will work to honor the commitments documented in the MOAs. In addition, industry and the FAA will work together to promote the use of Data Comm services across as many aircraft types beyond the incentivized equipage program with the joint goal of ensuring the benefits of Data Comm services are realized across the operation for all stakeholders and users of the NAS.

Development of a Recommendation for Equipage Target for Follow-On Capabilities:

The Data Comm program has achieved its goal of equipping a minimum 1,900 FANS 1/A and VDL Mode 2 equipped U.S. aircraft by the end of FY 2019. This goal was based on a minimum target of daily IFR flights to achieve operational benefits using CPDLC in domestic U.S. airspace. The range to achieve operational benefits of CPDLC in the NAS is between 20% and 40% of equipped IFR flights.

The Data Comm benefits case demonstrates that increased equipage translates to additional operational benefits to operators and the NAS. Additional equipage will drive benefits in specific regions, such as the Northeast Corridor. The Data Comm program projects substantial growth in the number of U.S. air transport category aircraft expected to be equipped for Data Comm out to 2035, see Figure 4.

Figure 4. Projected Data Comm Equipage



Key equipage assumptions:

- FAA's 2018 *fleet***Forecaster** output used to determine fleet make/model quantities through 2035
- NAC and other provided operator plans have been included in the forecast of equipped capable projections
- VDL Mode 2 is assumed to be standard or exercised option on all new aircraft deliveries
- A220 (CSeries) deliveries are included in the "New Single-Aisle Exercised Options" group
- At retirement, equipped aircraft are replaced by option exercised aircraft

The Data Comm NIWG seeks to establish fleet equipage targets for 2023:

- To support follow-on capabilities and targeting 40% of NAS operations, 3,800 equipped aircraft are sought
- To establish a strategy for regional jet equipage and for regional jets to participate in and receive benefits from Data Comm services

The 2023 target equipage rate of 3,800 air transport category aircraft could be achieved with a mix of initiatives:

- ~3,500 aircraft are expected to be equipped based on current state and exercised options.
- ~300 additional single-aisle aircraft could be equipped were operators to exercise available options.
- ~100 additional E-Jet regional aircraft could be equipped were operators to exercise available options.
- ~200 additional regional jet and turboprop aircraft could be equipped were manufacturers to make options available and were operators to exercise those options.
- Some portion of the unequipped current fleet of ~3,200 aircraft could be equipped where retrofit solutions are available and operator business case challenges could be overcome.
    - ~400 unequipped Airbus single aisle aircraft in the current fleet and scheduled to retire after 2025

Development of a Recommendation for Equipage Strategy for Regional Jets:
There are over 1,600 regional jets operating in U.S. domestic airspace. To date, the Data Comm Program is not aware of any regional jet operator equipping their current or future fleets with FANS 1/A. Data gathered from the regional jet operators indicates that a large portion of the regional jets manufactured in recent years are already equipped with VDL Mode 2. Some of these regional jet models with more advanced avionics have the capability to upgrade to FANS 1/A through a software update.

Initial analysis indications that only one of the two major regional jet fleets on order have an option for FANS 1/A and VDL Mode-2. The regional jet equipage strategy should encourage operators to order fleets with FANS 1/A and VDL Mode-2. In cases where solutions do not exist, the NIWG recommends that regional jet operators should encourage manufacturers of current in production models to develop an orderable FANS 1/A and VDL Mode-2 option.

Many of the congested airspaces where Data Comm can provide the most operational benefits, both En Route CPDLC and CPDLC DCL at airports, have a significant amount of regional jet operations. This regional jet activity is centered around the busiest metroplexes. Therefore, even a small percentage of the regional jet fleet equipping with Data Comm can dramatically increase the operational benefits of Data Comm in that airspace.

Targeting regional jet Data Comm equipage can add approximately 200 equipped aircraft. This can be achieved through a combination of retrofitting newer models and including Data Comm on newly delivered second-generation regional jets such as the E2Jet from Embraer.

The NIWG recommends industry continue to address these equipage challenges to achieve the goal of 3,800 equipped aircraft by 2023. The airline members of the NIWG will work with their regional partners and subsidiaries to develop a regional jet equipage plan. The NIWG also recommends addressing an incentive program for regional jet equipage.

Resolution of Avionics/Pegasus 1 Interoperability Issue

In November 2017, United, American, Delta, UPS and Air Canada met with Boeing and Honeywell to discuss a path forward to fix software issues in the B757 and B767 Pegasus 1 FMS. The meeting included a discussion on latent CPDLC avionics issues. The agreement reached at the October 4, 2017 NAC was that industry would address these issues and retrofit/upgrade the Pegasus 1 avionics by the end of CY 2021. Without a fix implemented in the field, more than 771 domestic B757 and B767 aircraft would not be able to participate in domestic En Route CPDLC after January 2022. In certain regions and airports (e.g., Atlanta, Memphis, Louisville, San Francisco, and Seattle), this may disproportionally affect operations due to the population of B757 and B767 aircraft. In the meeting with Boeing and Honeywell, the operators reviewed Pegasus 1 avionics operational and safety issues. It was noted that there are some CPDLC issues for which the FAA has developed ground mitigations for Initial En Route Services at the expense of the Data Comm program. It was agreed by all parties that these ground mitigations are not acceptable for the long term and need to be addressed prior to the end of CY 2021.

Subsequent to the November 2017 meeting, Honeywell determined that a fix to Pegasus 1 was not feasible and instead is planning to offer a Pegasus 2 upgrade as an alternative. At this time, it is unclear how many operators will install the Pegasus 2 upgrade due to cost and how many aircraft will not be able to participate in En Route Services starting in the CY2022. Removing more than 771 aircraft from En Route CPDLC operations would reduce the operational benefits of the program.

The Data Comm NIWG continues to recommend that fixes to the Pegasus 1 software and/or a Pegasus 2 upgrade be made available. Deliveries of new B767F continue so that operators have time to implement the changes prior to the end of CY 2021. Additionally, the NIWG recommends Boeing and Honeywell work with the operators to assist them in building their business cases. The NIWG will continue to monitor progress of Pegasus 2 upgrades and make recommendations for issue resolutions as necessary.

En Route Implementation Schedule

The implementation rollout schedule for En Route Initial Services presented above was coordinated with the stakeholder community, to include operators, controllers, and FAA facilities, labor and management. The rollout plan, which completes the implementation of En Route Initial Services by CY2019, was developed to ensure there was sufficient time to train the controller stakeholder community while minimizing the amount of time the NAS was in a transition state to having En Route Initial Services available NAS-wide.

It is critical Data Comm adheres to this agreed-to schedule, and not prolong the implementation transition period for these services. A protracted implementation would require the operators to re-plan and delay their training timelines, delaying their participation in the En Route phase of the program. This would result in a delay to the realization of long sought-after Data Comm En Route capabilities and their associated operational and safety benefits. This creation of a ‘splintered NAS’, where Data Comm Initial Services are available in some airspaces but not others for an extended period of time, would additionally denigrate the pilots’ confidence in the Data Comm systems and services, delaying its integration into day-to-day airline operations.

In order for the Data Comm Program to be successful, the FAA should minimize the amount of time the NAS is in a transition state for En Route Initial Services, and adhere to the implementation rollout as closely as possible. Industry and the FAA will continue to work together to identify the FAA and industry resources necessary to ensure a successful implementation of En Route Initial Services.

Full Services Commitment

The FY19 President's Budget Request includes no funding for En Route Full Services. The program has delivered Data Comm to 55 airports over two years ahead of schedule, is widely supported by the airspace users, and is on track to deliver En Route Initial Services starting in late 2018. The decision to eliminate funding for En Route Full Services was due to overall funding constraints. Data Comm has strong industry backing and regularly meets with airspace users ensure the program capabilities and services are aligned with industry plans. This collaboration creates a tremendous amount of forward momentum and cooperation. Restoring the baselined FY19 funding for Data Comm En Route Full Services ensures this momentum between the FAA and airspace users continues and does not jeopardize the airspace user's business case to invest in Data Comm avionics equipage, operations, and pilot training. Entities affected by this deferral in Data Comm En Route capability include airline end users, such as Alaska Airlines, American Airlines, Delta Air Lines, FedEx Express, Hawaiian Airlines, JetBlue Airlines, Southwest Airlines, United Airlines, and UPS 44 international airlines, hundreds of business aviation users, as well as FAA contractors Harris Corporation and Leidos.

Data Comm S1P2 Full Services consist of five Data Comm Services: Crossing Restrictions, Controller Initiated Routes, Direct-to-Fix, Advisory Messages and Holding Instructions. The majority of these services build on functionality developed for S1P2 Initial Services, which is in final development and testing. The additional Data Comm Full Services capabilities allow both Controllers and Pilots to further utilize the Data Comm system to gain operational benefits and efficiencies. First, these services will allow controllers to uplink any speed or altitude restrictions as the plane crosses a fix in the air. Secondly, Full Services will provide controllers and pilots an ability to send additional route messages to change the route of flight. Thirdly, Full Services will allow controllers to uplink repetitive advisory information thus reducing pilot voice requests for the information and allowing the Controller to uplink long holding instructions. The capabilities in Full Services will reduce the need for the controller or pilot to voice complicated instructions consisting of long strings or route fixes that can often cause controllers and pilots to repeat the information until correct and confirmed. The elimination of the Data Comm Full services capabilities would prevent the FAA from further reducing the congestion on radio frequencies, which would reduce the business case benefits and negatively impact the airlines investment in aircraft equipage, which would impact the NextGen benefits accrued in the NAS.

The FAA's investment in Data Comm is critical to improving air safety, reducing delays, increasing fuel savings, and protecting the environment. Today, controllers and pilots communicate verbally using radios. Voice communication is labor intensive, time consuming and limits the ability of the National Airspace System (NAS) to meet future traffic demand. With controllers talking to numerous pilots over the same frequency, there is also the potential for misunderstood instructions. Data Comm is changing this by allowing controllers and pilots to communicate with digitally delivered messages. Data Comm requires ground automation enhancements, an air-to-ground data network, and avionics in the aircraft. Unlike other airspace management enhancements, Data Comm relies on a small incentive fund to support and augment voluntary avionics equipage investment for airspace users. For the most part however, airspace users make the investments in equipment, training, and operations of Data Comm based on the benefits they receive by using the service. Currently at the 62 airports, Data Comm Departure Clearance is already used over 50,000 times weekly and by over 31% of all IFR flight plans filed. To date the Departure Clearance service has saved over 730,000 minutes of voice communications time since the start of operations.

The FAA is on track to start delivering Data Comm to En Route airspace in late 2018. The En Route capabilities are broken into two implementation phases to ensure the capabilities are delivered to the airspace in a safe and controlled manner. En Route Initial services provides basic Data Comm capabilities by migrating routine communications and limited routing capabilities from voice to data. En Route Full Services builds on Initial Services and delivers advanced flight routing capabilities of Data Comm in early 2022.

One significant example of benefits available to the airspace users in En Route Full Services is the ability for flight crews to request a new route during flight. Airlines have preferred routes around weather or to take advantage of favorable wind conditions, sometimes these routes are not available at departure, but open up during flight. Today requesting a new route is a cumbersome and time-consuming process with voice communications, quite often these requests are denied due to the time it takes to communicate, de-conflict, and clear the request from the flight crew. In En Route Full Services, the data link capability allows flight crews to request a more efficient route by electronically sending their preferred route to air traffic control. This capability enables pilots to quickly and seamlessly share their preferred route with the air traffic controller, giving them the same picture. If the route request does not pose a conflict, the controller can then send a revised route clearance back to the flight crew, quickly enabling them to program and execute their preferred route. The airlines anticipate this capability will enable them to fly more efficient routes, saving time and fuel. The airspace users have expressed through the NextGen Advisory Committee (NAC) and other forums that their business case for investing in Data Comm relies on the capabilities delivered by En Route Full Services.

NextGen Integration/Capabilities

The aviation functions of communications, navigation, and surveillance (CNS) have historically been considered as independent capabilities with little need to interface to meet airspace demands. As the aviation industry moves forward to redefine airspace and apply new technology to meet capacity demands, it is apparent that CNS must be considered as complimentary capabilities. The best example of the integration of CNS abilities is advanced interval management. In this case, an aircraft must have the capability to accept a complex clearance (Data Comm), to fly a precise ground track (navigation), and to position the aircraft on a final approach at a determined interval from another aircraft (surveillance). The timeline for implementation of advanced interval management is well beyond the scope of this rolling plan; however, the Data Comm team believes it is time to start initial coordination with other NIWG groups to begin discussions on how interfacing functions may be applied to meet current requirements. An example may be to data link an initial descent routing with altitude and airspeed constraints to meet metering requirements.

The Data Comm NIWG team plans to coordinate with the PBN, Surface, and NEC NIWGs to discuss ideas where coordination of functions may be useful. The PBN and NEC NIWGs have acknowledged the need to interface with Data Comm as a catalyst to meet their needs. A major element of NextGen is the use of infrastructure and advanced ATM to achieve operational goals: safety, capacity, efficiency, predictability, access, and environment. To achieve that goal, multiple parallel industry and FAA programs must coordinate their complex implementation plans. Also, it should be noted that the Data Comm NIWG will need to coordinate with the Surface NIWG to meet their milestone to provide runway/SID/STAR information in an uplinked route revision.

Enhanced Services Utilizing FANS 1/A Message Set

Airspace users recognize the opportunity to leverage their current investments by jointly defining additional services using the existing FANS 1/A message set with the FAA that enable the transition to trajectory-based operations in the NAS. Initial dynamic 4D trajectory management, in conjunction with the aircraft provision of its trajectory intent, provide the means for pilots and controllers to productively collaborate to increase flight efficiency and throughput in constrained airspace; and, to flexibility respond to rapidly changing conditions. By enabling these latent FANS 1/A capabilities, airspace users and the FAA reinforce the Data Comm value proposition; and, thereby, further incentivize additional aircraft users to equip.

Baseline additional Data Comm capabilities for En Route utilizing the existing FANS 1/A message set by the 3rd quarter of CY2021.

Initial Dynamic 4D Trajectory Management

Enhanced FANS 1/A services will provide additional capabilities to maintain flows through or increase capacity in constrained airspace. Controllers will have dynamic and precise trajectory options to use for equipped aircraft during changing operational conditions such as the ability to issue more efficient re-routes around an airspace constraint (e.g., weather, high-density traffic, or special activity airspace). In addition, pilots will be able to downlink more complex route clearance requests that express aircraft operator intent and aircraft-specific constraints. This capability will enable pilots and controllers to request and issue more precise route clearances via FANS 1/A, which contain some combination of lateral, vertical, and speed/time constraints at along-track waypoints on previously adapted ATC routes.

Speeds (Full Capability)

Controllers in the En Route environment generally issue speeds to aircraft to create or maintain spacing with other aircraft along their route of flight. Enhanced FANS 1/A services will provide controllers the option to uplink a speed to the aircraft and automatically update the fourth line of the data block. The ability to uplink these speed assignments enable other NextGen initiatives such as Path Stretch, Separation Advisories and Ground-Based Interval Management – Spacing. *Note: these were originally in Full Services but were deferred due to budget. The NIWG recommends moving the services back into Full Services.*

Complex Re-routes with Altitude, Speed, and Time Elements

Controllers in a TBO environment will be balancing demand among competing metered flows while maintaining separation. They will need to make use of the full capacity of available airspace resources that may require clearances using precise re-routes with altitude, speed, and/or time components. Automation, such as Path Stretch and Conflict Resolution Advisories, can provide solutions with these efficient yet complex clearances. FANS 1/A provides the means to deliver these complex clearances to the flight crew with greater precision and with lower workload for controllers and pilots, than with voice.

Adapted Arrivals

Enhanced FANS 1/A services will provide controllers the ability to uplink pre-adapted, non-published arrival procedures as complex re-routes. ATC facilities create these adapted procedures with input from user-stakeholders, offering significant efficiencies for FANS 1/A equipped aircraft. Once adapted in facility automation, equipped users can request a procedure name via FANS 1/A. Controllers then uplink the pre-adapted full route clearance containing both lateral and vertical guidance to pilots who then push-to-load the clearance into the flight management computer. These procedures may be revised and updated independent of a 56-day charting cycle allowing great flexibility in the NAS, meeting both user needs and air traffic control requirements. *Note: these were originally in Full Services but were deferred due to budget. The NIWG recommends moving the services back into Full Services.*

Tailored Arrivals

Extending the adapted arrivals service, enhanced FANS 1/A services will enable equipped aircraft to downlink dynamically-optimized tailored arrival descent profile requests to controllers. Ground systems will enable controllers to display these tailored arrival requests for evaluation against traffic and other constraints prior to modification and/or approval. By tailoring descent profiles for individual aircraft, equipped airspace users can maximize operating efficiencies that will benefit their bottom line as well as significantly reduce carbon emissions, benefiting the environment.

Enhanced TMC-Initiated Re-routes (AFST-generated flow strategies)

Traffic flow management decision support tools are expected to evolve to generate more precise initiatives that address predicted demand and capacity imbalances due to events such as convective weather. For example, Advanced Flight-Specific Trajectories (AFST) facilitates agile, flexible, and efficient use of En Route capacity that remains available in the context of thunderstorms and other dynamic constraints. AFST provides flight-specific lateral or altitude solutions within 90 minutes of a detected problem. When the AFST solution is delivered to the En Route controller, FANS 1/A provides the efficient clearance delivery method.

Initial Aircraft Intent

Currently, controllers and their decision support tools predict the expected behavior of aircraft through the filed flight plan as incrementally updated by clearances; as such, they cannot reliably predict some aspects of aircraft behavior (e.g., top of descent). Estimated aircraft paths, altitudes, and arrival times for the next route segment(s) of a flight are improved using downlinked aircraft performance and projection data (intermediate intent profile) from the flight management system via an air-to-ground data communications link using safety services (e.g., FANS 1/A automatic dependent surveillance – contract (ADS-C) intermediate intent or FANS 1/A controller-pilot data link communications reported route). The ground-based trajectory modelers used for tactical and strategic operations can use this aircraft data to calibrate the predicted 4D trajectory for the next portion of the flight and/or receive an indication that a trajectory performance parameter (altitude, time) can no longer be met. These improvements will result in better 4D trajectory composition, determining adherence to clearances, and conformance monitoring/ conflict detection accuracy. These initial services provide an important step towards full air-to-ground trajectory synchronization.

Loadability Solution for Runway Dependent SID/STARs

One of the primary goal of the Data Comm Implementation Team (DCIT) has been to implement CPDLC messages to maximize existing flight deck automation through the use of loadable messages. Loading complex route changes provides benefits through reduced communications errors for complex communications, enabling increased information exchange leading to increased airspace efficiency. The increased airspace efficiency creates an environment in which there are reduced flight delays and more optimal flight routes enabling lower fuel burn.

Problem Background: During the early design phase of Data Comm, it was identified that CPDLC services were limited to the information available in the automation systems delivering the clearance. One such example is the tower data link system does not have the complete information to provide the runway element as part of the uplinked, loadable departure clearance. This data element shortcoming is due to a lack of FAA tower automation capability.

Modern RNAV SID, STAR, and RNAV/RNP approach procedures include the runway element as a dependent part of the procedure – meaning without the runway, the clearance would be incomplete.

This led to the Data Comm system designers to not send the Standard Instrument Departure (SID) element of the DCL because many SIDs are designed with a runway as a dependency.

A fully loadable CPDLC clearances results in:

- Increased operational benefit efficiencies,
- Decreased workload and time for pilot to understand and accept clearances,
- Reduced voice ATC calls for clarification
- Enhanced safety

FAA is developing enhanced automation capabilities such as Terminal Flight Data Manager (TFDM) which could provide the ability for all clearance data elements to be available.

Recommendation: As part of FAA tower automation enhancements (i.e., TFDM), FAA should develop and implement the capability to uplink all loadable route clearance elements, including runway. This capability should be developed and implemented in the Data Comm Full services timeframe (2022).

Solution for Full Automation for the Confirm Assigned Route Capability

The NIWG recommends the FAA consider adding automation enhancements to support the validation of uplink message for "Confirm Assigned Route" and it should be implemented in the Full Services timeframe. When a re-route message is issued, the flight crew currently responds by sending the entire active route loaded in the FMC back to the controller. ERAM should be programmed to evaluate the response and only notify the controller/pilot if the assigned route does not match the Confirm Assigned Route, as is done in Nav Canada and NATS. Currently, the controller is expected to manually go through the Confirm Assigned Route message looking for errors. This new capability would further realize the benefits of Data Comm, which is to reduce the possibility of human error.

Data Comm NIWG Milestones

Milestone	FAA or Industry	Implementation (I) or Pre-implementation (P)	Milestone Date Q/CY
Airlines to Equip 1,900 Aircraft	Industry	I	4Q2019
Deploy Tower Services to an additional seven towers	FAA	I	3Q2019
Baseline Enhanced Data Comm Services for En Route utilizing the existing FANS 1/A message set	FAA Industry	P	3Q2021
IOC for Initial En Route Services at all CONUS ARTCCs	FAA	I	4Q2019
Resolution of avionics/Pegasus 1 interoperability issue	Industry	I	4Q2021
Recommendation for target equipage rates for follow-on capabilities	FAA Industry	I	1Q2019
Recommendation for the equipage strategy for Regional Jet equipage	Industry	I	1Q2019
Loadability Solution for Runway SID/STARs	FAA	P	3Q2019
Solution for Full Automation for the Confirm Assigned Route Capability	FAA	P	3Q2019

Multiple Runway Operations (MRO)

Implementation Milestones

- Implement Consolidated Wake Turbulence (CWT) standards at remaining Wake RECAT locations and convert 17 legacy RECAT 1.5 and 2.0 terminals to CWT.

Pre-implementation Milestones

- Perform feasibility and initial safety analysis for improved capacity Closely Spaced Parallel Operations (CSPO) departure concepts.
- Perform feasibility and initial safety analysis for improved capacity CSPO integrated arrival/departure concept.
- Complete safety study of Closely Spaced Parallel Operations with High Update Rate (HUR) Surveillance to determine the minimum runway separation requirements for simultaneous independent operations to dual and triple parallel runways.
- Continue research into and assess benefits of dynamic wake separation concepts, including dynamic pair-wise separation, time based separation, and separation reductions based on real-time conditions in the airspace.
- Perform feasibility study of reduced Minimum Radar Separation (MRS) on final approach including collision risk, impacts on go around rates, and runway occupancy restrictions.
- Analyze ORD Runway 28C Arrival/Runway 22L Departure Wake Encounter Issue and develop mitigation strategies to reduce or eliminate departure delays in this configuration.
- Perform wake behavior analysis to support the use of authorized RNAV (LPV, LNAV/VNAV, RNP-AR) approaches in lieu of ILS for 7110.308 on SFO Runways 19L, and 28L/R and any other locations regularly using 7110.308 procedures.
- Develop and publish additional guidance material for aircraft operators on wake turbulence encounter reporting to promote awareness and support FAA wake encounter data collection. Distribution of this guidance could be accomplished using Safety Alert for Operators (SAFOs), Information for Operators (InFOs, AIM, Advisory Circular update (AC 90-23) Aircraft Wake Turbulence, or direct pilot outreach.

Industry Milestones

- Perform or support assessments of the benefits of CWT implementations at new and legacy RECAT locations to verify no loss of benefits when compared to prior RECAT implementations.
- Collaborate with FAA to promote increased pilot reporting of significant wake turbulence encounters during all phases of flight.

Background

With increasing demand for air travel, the need for improved peak throughput at the busiest airports and in the highly congested arrival and departure airspace is essential to improve performance in our National Airspace System. Increased runway and airport capacity via new procedures, reduced spacing and separation requirements, and more efficient flow management into and out of busy metropolitan airspace is needed to accommodate current and future increases in traffic volume and maximize airport utilization.

Delays ripple throughout the NAS when closely spaced parallel runways are not utilized to the greatest extent possible. This happens frequently when the ceiling and visibility do not support visual approaches. With new technology in the cockpit and a concerted effort to examine wake behavior and the safety standards for closely spaced parallel runway operations, the FAA has made significant progress in providing new procedures and tools to better utilize runway capacity in all weather conditions. With these new procedures and data-driven changes to wake turbulence separation standards (Wake RECAT), we now have the ability to implement a suite of Multiple Runway Operations (MRO) capabilities to maximize arrival and departure rates in more weather conditions.

In 2013, FAA requested the NextGen Advisory Committee (NAC) to develop recommendations related to the FAA's NextGen investments considering the uncertainty of funding for NextGen projects at that time. The MRO portfolio, including Wake RECAT was selected as a high priority initiative because it was capable of rapidly delivering tangible benefits with minimal cost and was expected to be available at specific locations within a three-year rolling time horizon. It was expected that the new procedures and separation standards could deliver immediate benefits to the NAS in this timeframe as long as resources remained available for required safety studies and implementation activity with no unforeseen issues arising during the safety assessment, environmental review, or implementation processes.

The impetus and foundation for the MRO capabilities evolved from specific industry recommendations on "Runway Access" and other longstanding FAA wake turbulence research and development activities. The new separation standards in general, and Wake Turbulence Re-Categorization (Wake RECAT) in particular, have been providing immediate increases in capacity and a reduction of delays at airports implementing the new procedures.

Consolidated Wake Turbulence (CWT) Radar Separation Standards – The Wake RECAT Evolution (FAAO 7110.126)

New wake separation standards are the result of continuing research on wake generation, transport and decay. The FAA Wake Program continues to evolve as the understanding of wake behavior increases and new automation and controller decision support tools become available. Prior to introducing RECAT at selected high value sites in the NAS, wake separations were assigned based on an aircraft's Maximum Certificated Gross Takeoff Weight (MCGTOW). These separations have proven to be very safe for wake vortex hazards; however, it results in greater than necessary separation distances, especially within the heavy weight class. For example, the current FAAO 7110.65 heavy-behind-heavy separation is four miles. This separation is appropriate for a B767 following a B747, but not necessary when the B747 is following the B767.

Wake RECAT separations consider aircraft weight as before, but also consider aircraft wingspan, approach speed and ability to counteract a wake's rolling motion. Using these parameters, FAA recategorized the existing fleet of aircraft and modified the associated wake turbulence minimum separations.

Under the RECAT 1.0 and 1.5 programs, FAA created six categories of aircraft for wake turbulence separation purposes. The categories separated the heavy and large weight classes into four wake categories: two for heavy and two for large. The A388 and A225 became their own wake category, and the small weight class remained as its own wake category.

RECAT 2.0 describes a pairwise separation matrix developed for the most common ICAO type identifier aircraft that comprise 99% of the operations at 32 airports within the U.S. Each aircraft is addressed as both a leader and a follower in each pair. The development of a pairwise separation matrix relies on wake-based data, rather than the legacy weight-based data. Separation reductions are achieved through a better understanding of wake behavior and with pairwise separation of aircraft.

All four of these sets of separation standards have been approved by Safety and Technical Training (AJI) and AOV and have been proven safe operationally. Each set of standards has shown operational benefits aircraft pairings compared to other sets of standards.

The goal of CWT is to use the most operationally advantageous set of separation standards derived from the four current sets of standards. This has resulted in using all time-based wake turbulence separation standards from FAA Order JO 7110.65. Radar-based wake turbulence separation will be based on a categorical system that further refines the grouping of aircraft to provide throughput gains at many of today's constrained airports and yet will be manageable at all airports throughout the NAS.

To date, FAA has made significant progress rolling out Wake RECAT 1.5, 2.0 and CWT at the busiest and most congested terminal areas and airports in the NAS. The FAA has used a phased approach that included continuous learning and refinement while examining operational benefits at specific airports.

Since 2012, Wake RECAT Phase 1 (RECAT 1.5) has been introduced at 23 airports. Phase 2 (RECAT 2.0), static pairwise separation, introduced in September 2016, has been implemented at 8 additional facilities. The introduction of new Consolidated Wake Turbulence (CWT) separation standards began in July 2018 at Phoenix and San Antonio, and at Potomac TRACON in September. The remaining airport/terminal area RECAT commitments will be upgraded to CWT by the end of Q2 2019.

Implementation Plan

Scope

NextGen Multiple Runway Operations capabilities improve access to parallel runways, including closely spaced parallel runways, while Wake RECAT, going forward with CWT and dynamic wake separation concepts (time based separation, etc.) can increase basic runway capacity and airspace throughput. The capabilities in this portfolio have enabled the use of simultaneous approaches (two or more aircraft arriving side-by-side) during periods of reduced flight visibility, decreased the required separations between aircraft on dependent approaches (staggered aircraft arrivals on parallel runways), and optimized wake turbulence separation standards.

These systemic improvements are key to ensuring the necessary minimum separation is applied between aircraft based on extensive data collection and analysis and wake turbulence research conducted over the last 20 years. CWT uses the most operationally advantageous, currently approved radar separation standards (RECAT and FAAO 7110.65) and the existing time based separation standards in FAAO 7110.65 to optimize wake separations and provide maximum benefits. Going forward, the MRO Rolling Plan will capitalize on continuing wake research and associated automation and surveillance improvements to provide meaningful incremental capacity benefits for the NAS by continuing to explore the benefits of dynamic pair-wise and time based separations and pursuing the other pre-implementation milestones listed above and further described below.

Expected Benefits and Metrics
The capabilities recommended in this report will provide benefits via increased arrival and/or departure capacity and throughput. This will lead to reduced delays, more flight opportunities, and better reliability and predictability for the traveling public, particularly during less-than-visual approach weather conditions. The increased capacity available with Wake RECAT, which is usable regardless of prevailing weather conditions, may enable air carriers to achieve additional service capabilities for the traveling and shipping public without a degradation of service quality.

Ultimately, the benefits of new separation standards, including Wake RECAT and CWT, are a function of the fleet mix and demand, as well as runway configuration. The JAT has completed several benefits assessments of RECAT sites and confirmed expected reductions of separation at those sites for relevant aircraft pairings. Going forward, industry will perform or support benefits assessments of the new Consolidated Wake Turbulence standards at select new or legacy locations. It is essential that each iteration of wake standards changes safely provide actual or potential incremental capacity and throughput improvements based on fleet mix and demand. To that end, industry will collaborate with FAA to develop a more robust wake vortex encounter reporting system, including appropriate descriptors similar to existing turbulence intensity reporting criteria and appropriate guidance to pilots including preferred reporting procedures, that is, direct to ATC, or via other means (Aviation Safety Reporting System, etc.).

Recommendations

Recommendation 1: Implement new Consolidated Wake Turbulence standards at legacy RECAT sites on a schedule determined collaboratively with industry based on expected benefits and facility capabilities in accordance with the milestones below.

Recommendation 2: Perform feasibility and initial safety analyses for closely spaced parallel operations departure concepts. This analysis will investigate procedures to recover lost capacity through reduced separation standards and increased applications of dependent and independent operations for Closely Spaced Parallel Runway departure operations. The analysis will be focused on finding ways to develop and update standards and terminal instrument procedures to recover lost capacity due to IMC events by taking advantage of improved course deviation modeling, new aircraft systems with advanced navigation accuracy, and advanced surveillance capabilities.

Recommendation 3: Perform feasibility and initial safety analysis for CSPO integrated arrival/departure concepts**.** This analysis will look for opportunities to reduce the required separation between a departing aircraft on one runway and an arrival on a closely spaced parallel runway, which will increase airport throughput in less than visual conditions. National standards for reduced initial lateral separation between arrivals and departures using closely spaced parallel runways will be based on the results of research that assess the current rule for parallel runways with centerline spacing less than 2500 feet that allows departing aircraft to begin takeoff roll when the arriving aircraft is at least 2 NM out, provided that by 1 minute into the departing aircraft's flight, separation increases to 3 NM. An analysis of lateral and vertical behavior for aircraft when executing a missed approach or divergent departure next to an active parallel will assist with determining whether improvements can be safely implemented.

Recommendation 4*:* Complete safety study of Closely Spaced Parallel Operations with High Update Rate Surveillance. This safety study provides analysis of the minimum runway spacing requirement for simultaneous independent operations to parallel runways while using high update rate (HUR) surveillance. Collision risk is assessed as a function of HUR surveillance capabilities and runway centerline spacing (RCLS) to simultaneous independent dual and triple straight-in and offset final approach courses for Instrument Landing System (ILS) and Global Positioning System (GPS) equipped Area Navigation (RNAV)/Required Navigation Performance (RNP) aircraft. Although this capability may have systemic utility, near term benefits could be realized at JFK, DTW and ORD for simultaneous dual and triple approaches using straight-in ILS procedures versus the current standard that requires an offset approach with runway separations below 3600 feet.

Recommendation 5: Continue research for dynamic pair-wise and time based wake separation concepts. This activity will continue prior efforts to increase throughput at capacity-constrained, high-density airports by researching the aircraft and ground based capabilities required to achieve safe, efficient dynamic pair-wise and time based wake separations for aircraft on approach. The FAA will complete concept and initial safety analysis documentation for dynamic wake spacing to allow for reduction of the RECAT Phase II static pair-wise wake separation standards based on the variable, real-time conditions in the airspace, such as the current winds. This will build on the previous pre-implementation commitment to analyze Heathrow's Time Based Separation concept on final approach, to be completed by 2018.

Recommendation 6: Perform feasibility study of reduced Minimum Radar Separation (MRS) requirements on final approach including collision risk, impacts on go around rate, and runway occupancy restrictions. This activity will investigate MRS requirements for aircraft on approach to allow closer separations when applicable, including extending the current capability to reduce final approach spacing to 2.5 nm within 10 miles out to 20 miles, where currently authorized. Changes to radar separation minima implemented at airports with applicable fleet composition will increase capacity during IMC. Reducing longitudinal separation standards during IMC will provide benefits to airport runway throughput when Runway Occupancy Times allow, while not adversely impacting collision risk, wake risk, or go-around rates. Since go around rates and runway occupancy time are a function of exit locations and fleet mix, the opportunity to universally reduce MRS at more locations will induce airport operators to build more efficient runway exits where they do not exist. This recommendation should consider application of the "2400 meter Reduced Runway Separation Standard" in use in Australia and other locations to facilitate reductions in MRS. This activity should also build a bridge to the reduced separations and increased throughput envisioned with ADS-B In functionality by driving improved exit locations where needed.

Recommendation 7: Perform wake behavior analysis to authorize the use of RNAV (LPV, LNAV/VNAV, RNP AR) approaches in lieu of ILS for 7110.308 operations on SFO Runways 19L and 28L/R and any other locations that routinely use .308 procedures in the future. FAA Order 7110.308C allows a reduction in the required wake separations for dependent operations for runways less than 2,500 feet apart when small or large category aircraft are leading in the dependent pair. The FAA will perform analysis of 7110.308C operations for SFO Runway 19L, 28L and 28R utilizing RNAV approaches to one or both runway ends, which would allow for continued use of 7110.308 operations when an ILS is out of service.

Recommendation 8: Perform wake analysis of ORD Runway 28C Arrival/Runway 22L Departure Wake Encounter Issue and develop mitigation. The FAA will perform this analysis to assess wake separation application at ORD after pilot reported wake encounters led to additional separation being provided by ATC for departures from ORD runway 22L following a Heavy arrival to runway 28C. FAA will analyze wind sensor data acquired at ORD along with aircraft wake data to assess the continuing need for the increased separation (time) or alternatively to explore potential mitigations to reduce the separation.

Recommendation 9: Develop and publish additional guidance material for aircraft operators on wake turbulence encounter reporting to promote awareness and support FAA wake encounter data collection. Distribution of this guidance could be accomplished using Safety Alert for Operators (SAFOs), Information for Operators (InFOs), AIM, Advisory Circular update (AC 90-23) "Aircraft Wake Turbulence," or direct pilot outreach.

This process will inform industry of the need to report wake encounters through PIREPs, ASRS, and other reporting means to ensure tracking of wake safety issues.

Recommendation 10: Industry will support or perform benefits assessments with data, and/or other resources to ensure there is no loss of capacity or throughput at select initial CWT locations or when CWT is implemented at existing RECAT 1.5 and 2.0 airports. Based on the outcomes of these industry assessments, industry may request the JAT to make a more in-depth analysis of a specific site to validate CWT benefits and separations.

Recommendation 11: Industry to support and distribute FAA guidance material relating to wake turbulence reporting through appropriate means of communication to crews. The methods by which operators communicate the need for increased wake encounter reporting will be dependent upon the approach and guidance issued by the FAA. Industry will inform flight crews of this important reporting element and communicate appropriate steps to be taken based on FAA guidance. This support will include the provision of FAA material highlighting the need for wake encounter reports and documenting the desired reporting methods and procedures.

MRO NIWG Milestones

Milestone	FAA or Industry	Implementation (I) or Pre-implementation (P)	Milestone Date Q/CY
Convert 5 legacy Wake RECAT 1.5 or 2.0 sites to CWT	FAA	I	4Q2019
Convert 7 legacy Wake RECAT 1.5 or 2.0 sites to CWT	FAA	I	4Q2020
Convert 5 legacy Wake RECAT 1.5 or 2.0 sites to CWT	FAA	I	3Q2021

Milestone	FAA or Industry	Implementation (I) or Pre-implementation (P)	Milestone Date Q/CY
Perform feasibility and initial safety analysis for CSPO departure concepts	FAA	P	3Q2019
Perform feasibility and initial safety analysis for CSPO integrated arrival/departure concepts	FAA	P	3Q2020
Complete safety study of Closely Spaced Parallel Operations with High Update Rate Surveillance	FAA	P	2Q2019
Continue research on dynamic and time based wake separation concepts	FAA	P	4Q2019
Perform feasibility study of reduced MRS on final approach including collision risk, impacts on go around rate, and runway occupancy restrictions	FAA	P	1Q2020
Analyze ORD 28C Arrival/22L Departure Wake Encounter Issue and develop mitigation	FAA	P	4Q2019
Analysis of use of RNAV (VNAV) approaches for 7110.308 on SFO 19L/28L/R	FAA	P	4Q2019
Provide guidance material to operators about wake turbulence encounter reporting in the NAS	FAA	P	2Q 2019

Milestone	FAA or Industry	Implementation (I) or Pre-implementation (P)	Milestone Date Q/CY
Operator assessment of benefits from CWT implementations at initial CWT locations and at existing RECAT 1.5 and 2.0 sites	Industry	I	4Q2020
Encourage aircraft operators to report wake encounters via pilot reports to ATC or aviation safety databases based on FAA guidance material	Industry	I	4Q2019

Risks and Other Considerations

The following risks and assumptions were considered as part of the recommended action plan. They must be addressed and/or mitigated to ensure MRO activities continue to provide the benefits the program has delivered to date.

- Successful completion of requisite safety studies and environmental reviews and achieving stakeholder alignment on new standards
- Ensuring continued funding support for safety studies, automation enhancements and implementation
- Ensuring the NAS-wide implementation of the "Consolidated Wake Standard" does not slow down or adversely impact pursuit of the longer term goal of further optimizing separation using Dynamic Wake Separations (Time/Wind Based Separation) to enhance operations and maximize benefits
- Ensuring no loss of benefits due to near-term implementation of Consolidated Wake Turbulence Standards
- Achieving desired reductions in simultaneous parallel runway separation standards using High Update Rate Surveillance with possible application at DTW, ORD, JFK
- Resolving the "LNAV Only" Issue for simultaneous independent parallel operations with a specific focus on "short duration" planned and unplanned ILS outage scenarios. Note: this item was previously removed from our work plan, but has continuing value, particularly as the fleet of LNAV only aircraft diminishes resulting in reduced potential exposure.
- Successful introduction of BOS Runway 4L RNAV Procedure for 7110.308 Operations – This initiative was removed from our work plan due to environmental issues, but the procedure holds great value for maintaining a "closer to VMC" arrival rate when the facility cannot conduct visual approaches.

Operational Use

The MRO NIWG team is committed to implementing reduced separation capabilities through operational use. However, the implementation of new procedures may require additional time to address specific environmental or operational concerns. The team remains committed to monitoring the progress of the following beneficial capabilities:

- BOS Runway 4L RNAV Approach/7110.308 Procedures
- VNAV requirement for closely spaced parallel approaches with ILS out

As we implement new procedures through 2021, there may be additional procedures that will require MRO NIWG review and input based on operational needs and constraints.

Performance Based Navigation (PBN)

Background

Successful pre-implementation and implementation activities identified by the PBN NextGen Integration Working Group (NIWG) have advanced PBN and led to operational approvals that facilitate the use of emerging PBN capabilities. Metroplex projects and single site PBN implementations outlined in previous NIWG plans have continued to proliferate PBN throughout the NAS.

However, the 2016 PBN NAS Navigation Strategy established Near-Term and Mid-Term Goals that the FAA and industry are challenged to meet. With the goal of bringing the NAS Navigation Strategy to an operational level of implementation, the PBN NIWG has identified a number of planning elements that attempt to address the deficiencies for the time frame of CY2019-2021. The planning elements that can be codified are included in this Report as Pre-Implementation and Implementation Milestones. The activities that cannot be codified or do not have any available resources within the FAA are accounted for as Recommendations.

These commitments and recommendations are organized into eleven discussion areas that reflect the primary topics of the NIWG's deliberations, and are summarized into two tables at the end of the PBN section.

- Initial Trajectory Based Operations and PBN Harmonization: PBN is a key element of the FAA's efforts to transform the NAS to Trajectory Based Operations (TBO), optimizing flights using time-based management (TBM), the aircraft's ability to fly precise paths (through PBN), and information exchange between air and ground systems. Members of the NIWG have expressed strong interest in seeing benefits that have long been anticipated through harmonized deployment of aircraft equipment, Initial TBO (iTBO) technical and organizational elements, and PBN procedures. The complexity of iTBO implementation will require regular, robust engagement of industry and government stakeholders to ensure complete success.

- Consistent and Sustainable Funding for PBN Implementation: Sufficient funding of FAA PBN activity is necessary to achieve the scale of effort necessary to meet the goals of the NAS NAV Strategy and the evolution to TBO. A stable, sustained funding source is needed to support the national PBN infrastructure necessary to accomplish the move to TBO, to meet NextGen goals, and transition to the future described in the 2016 NAS NAV Strategy and the TBO Vision.

- Understanding and Addressing the Barriers to Established on RNP (EoR): The NIWG has identified airport candidates to be considered for continuous connected descents and Established on RNP (EoR) operations into dependent runway configurations. The NIWG discussed at length the inconsistent PBN operations at select airports where procedures are available, and the opportunity to extend EoR operations to these airports using existing published PBN procedures. The NIWG has identified a need to understand the extent of barriers to extension and identify mitigations that would allow for the exploitation of aircraft equipage investment, using a site-specific context.

- Holistic Approach to Aircraft Equipage: A critical risk factor is the equipage capability of aircraft. Required certifications are equally important. Industry equipage and certification plans may not support the 2025 capabilities described in the PBN NAS Nav Strategy, and without certain aircraft capabilities, the benefits of the FAA's iTBO implementation plan may be limited. There is an urgent need for a holistic study of both industry and FAA benefits resulting from a harmonized deployment of aircraft capability, iTBO infrastructure, and PBN procedures, inclusive of data communications, navigation, and surveillance capabilities.

- Procedures Gateway Transparency: Previous rolling plan accomplishments have been possible through successful Industry and FAA collaboration. Transparency and accountability for commitments is essential to continuing this success. Communications and coordination challenges have frustrated Industry proponents. The development and implementation progress should be tracked consistently and made available to stakeholders in a timely manner through the IFP Gateway.

- Post Implementation Reporting: Industry stakeholders, including operators and airports, have important perspectives, feedback, and sometimes data that are necessary inputs to the post-implementation process. Full accounting of benefits and consequences of implemented procedures should be part of post-implementation reporting. Industry should have the ability to review and concur with analysis findings and conclusions.

- Track-to-Fix: The PBN NIWG Track-to-Fix EoR milestones from the previous PBN NIWG plans had been held in abeyance and were closed due to concerns raised by aircraft lacking vertical navigation guidance (VNAV) capabilities resulting in potential increased risk of Controlled Flight into Terrain (CFIT) in the final approach segment. They will continue its technical effort, addressing the remaining research items and develop additional mitigation options.

- Advanced RNP: A-RNP offers key benefits provided by RNP, including RF (Radius -To-Fix) curved paths but without some of the certification costs and regulatory requirements. This offers an attractive option for operators with RF capability on various legacy fleets that are not RNP AR. Flights have begun to use these procedures and experience gained from those flights will be collected and shared.

- GBAS/GLS: Industry is asking for a clear plan for GLS Operations, including near-term authorization for Category II minimums and eventual evolution to full Category III. Industry equipage is growing rapidly and concerns about a "mixed equipage" environment can be overcome. GBAS can be used to support precision approaches where none are currently available, achieving a key industry objective of precision approach guidance to all air carrier runways.

- NSG 1 Airports and Metroplex: NSG 1 airports have some of the most complex conditions in the NAS. PBN procedures at these airports should reduce pilot/controller workload and increase schedule reliability/efficiency without reducing airport capacity. As the Metroplex effort completes the final four sites, lessons learned throughout the whole effort should be accumulated and shared.

- NSG 5 Airports and Heliports: In reviewing NSG 5 airport and heliport PBN goals, implementing vertical navigation to more landing surfaces was determined to bring near-term safety and operational benefits and improve the business case for individual operators to equip with PBN capabilities.

The NIWG identified the following risks as critical to implementing PBN and iTBO between CY2019 and the end of CY2021:

- Balancing of aircraft equipage capabilities
- Community acceptance of changes in procedures
- Controller decision support system tools to accommodate and leverage PBN procedures and equipage.

Proposed PBN performance indicators focus on expected outcomes for airlines and airspace users from implemented PBN procedures when combined with necessary aircraft equipage and the appropriate ATC airspace management tools. Successful PBN implementation is site-specific, and the indicators should be defined based on the operational uniqueness of each implementation and tie back to the operational objective of the PBN implementation.

PBN Implementation Findings, Recommendations and Commitments

Initial Trajectory Based Operations and PBN Harmonization

PBN is a key element of the FAA's efforts to transform the NAS to Trajectory Based Operations (TBO), optimizing flights using time-based management (TBM), the aircraft's ability to fly precise paths (through PBN), and information exchange between air and ground systems. The PBN NAS Navigation Strategy outlines the integral nature of PBN and TBM. Essentially, transition to time-based management is necessary to enable higher percentages of PBN operations, using speed, a defined lateral maneuver, or time control to keep flights on their optimal path. Members of the NIWG have expressed strong interest in seeing benefits that have long been anticipated through harmonized deployment of aircraft equipment, Initial TBO (iTBO) technical and organizational elements, and PBN procedures.

TBO seeks to improve operational predictability through more accurate and efficient end-to-end strategic planning and scheduling. Enterprise enablers[1] and data sharing[2] will help address weather and other uncertainties that are potential risks for traffic flow management and routing. Initial TBO capabilities include a number of tools identified in October 2016 report on PBN time, speed, and spacing, including Converging Runway Display Aid (CRDA), Integrated Departure/Arrival Capability (IDAC), Ground Interval Management – Spacing (GIM-S), and Terminal Sequence and Spacing (TSAS). The FAA is focusing on arranging a suite of capabilities with other enablers to enable a more complete set of PBN benefits. A listing of iTBO capabilities and enablers is included in Appendix B. The integration of PBN and TBM presents the opportunity to transition implementation commitments from milestones that focus on individual tools, to integrated commitments that emphasize desired operational outcomes by location and time.

The complexity of iTBO implementation will require regular, robust engagement of industry and government stakeholders to ensure complete success. There are many details to absorb and work through. Industry is particularly interested in understanding the projected level of benefit from iTBO capabilities, and the anticipated increased utilization of PBN. Industry and FAA investments will be interdependent, with decision makers looking for demonstrated benefits. While the continuation of the

[1] Additional detail on Data Communications capabilities and schedule are included in the Data Communications NIWG portion of the Rolling Plan

[2] Additional detail on TFDM capabilities and schedule are included in the Surface and Data Sharing NIWG portion of the Rolling Plan

NIWG process has been proposed, clarity is needed regarding the management of collaborative work efforts during this critical phase of iTBO deployment.

Implementation Commitment: Implement select iTBO capabilities that will enable more precise trajectory management, collaborative scheduling, and repeatable PBN procedures; together designed to increase use of existing capacity, improve operational predictability and flexibility, and enhance flight efficiency:

- In the Northeast Corridor by Q4 CY21[3]
- At an additional operating area (Northwest Mountain - Denver) by Q4 CY20
- At an additional operating area (Southeast – Atlanta) by Q4 CY21

Consistent and Sustainable Funding for PBN Implementation

Sufficient funding of FAA PBN activity is necessary to achieve the scale of effort necessary to meet the goals of the NAS NAV Strategy and the evolution to TBO. Industry and FAA must mutually invest and commit to developing a framework for synchronizing PBN with iTBO implementation.

The 2016 PBN NAS NAV Strategy describes commitments and time periods necessary to transition to the "PBN-centric" US National Airspace System of the future. These goals are difficult to achieve with the current resources and funding mechanisms associated with PBN. The lack of resources reduces the ability to keep up with the production schedule and leads to inefficient procedure maintenance. It can take years to get a new procedure or an amendment implemented. A clearly understood process to prioritize procedure requests is needed. Without resources and understood priorities, the length of time to develop and implement procedures will continue to lengthen, threatening the success of the NAS NAV Strategy.

The NIWG also recognizes that the restrictions of the annual operations funding cycle for the FAA's PBN program lacks the structure and multi-year planning offered by other infrastructure elements of the overall NextGen program. A stable, sustained funding source is needed to support the national PBN infrastructure necessary to accomplish the move to TBO, to meet NextGen goals, and transition to the future described in the 2016 NAS NAV Strategy and the TBO Vision.

Recommendation: The FAA should develop a multi-year capital implementation plan for PBN that serves as a roadmap for the completion of the 2016 NAS NAV Strategy. The plan should be resourced appropriately to support the PBN transition described in the strategy document.

Understanding and Addressing the Barriers to Established on RNP (EoR)

While implementing and using PBN procedures at the nation's busiest airports is an important NextGen objective, enabling PBN operations at airports with lesser dense traffic is also an important goal. The NIWG has identified airport candidates to be considered for continuous connected descents and Established on RNP (EoR) operations into dependent runway configurations. The NIWG discussed at length the inconsistent PBN operations at select airports where PBN procedures are available, and the opportunity to extend EoR operations to these airports using existing published PBN procedures.

The progress accomplished with EoR at DEN has presented additional opportunities to expand that success to other airports (20 candidate airports identified by set of NIWG Technical Pilots). This

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[3] Additional detail on NEC capabilities and schedule are included in the NEC NIWG portion of the Rolling Plan

opportunity is challenged by barriers perceived by industry and government that must be resolved for widespread deployment of EoR operations. These barriers to EoR include but are not limited to:

- Finding solutions for both Independent and Dependent Simultaneous RNP approaches
- Finding solutions for use of EoR procedures in both IFR and VFR conditions
- Modernizing separation standards to support EoR operations
- Amending FAA criteria to retain current efficiencies in EoR operations
- Defining a path forward for aircraft equipage
- Pilot/controller training requirements for EoR operations

The NIWG has identified a need to understand the extent of these barriers and identify mitigations that would allow for the exploitation of aircraft equipage investment, using a site-specific context. Six airports, that are representative of NSG 1-4 airports with existing procedures and equipage, were identified as primary candidates for this deep-dive analysis: Denver International (DEN), George Bush Intercontinental (IAH), Nashville International (BNA), Portland International (PDX), Austin-Bergstrom International (AUS), and Sacramento International (SMF). These airports were selected for the unique attributes and opportunities that each one offers.

<u>Pre-implementation Commitment</u>: The FAA will lead an effort partnering with Industry to analyze potential constraints and causes that inhibit the consistent use of EoR procedures at select NSG 1-4 airports in the NAS by Q1 CY20. Industry's broad expertise will contribute important perspectives and experience to this effort. This analysis will also recommend next steps to address the identified constraints and causes. The scope of this analysis includes, but is not limited to: procedure criteria, separation standards, and merging/spacing needs. Three airports selected from the six candidates will be analyzed, representative of NSG 1-4 airports.

<u>Industry Commitment</u>: Industry will identify the three airports for detailed analysis by Q4 CY18. The FAA and its support may provide analysis and data to inform Industry decision.

<u>Recommendation:</u> The FAA and Industry should assemble a collaborative group to evaluate how to overcome the set of barriers studied in the FAA Pre-Implementation Milestone. This multi-disciplined group will consider how to resolve the full set of barriers, to enable widespread deployment of EoR operations, with a particular need for advanced deployment timelines at NSG 2 and NSG 3 airports.

Holistic Approach to Aircraft Equipage

A critical risk factor is the equipage capability of aircraft. The majority of aircraft in the mainline air carrier fleet have Advanced Required Navigation Performance capabilities. However, regional airline and general aviation aircraft fleets have a much lower percentage of equipage. Required certifications (e.g. for RNP AR (Authorization Required)) are equally important. Industry equipage and certification plans may not support the 2025 capabilities described in the PBN NAS Nav Strategy. Recent equipage inventories estimate that there are as many as 1,000 mainline and regional aviation aircraft that are not equipped with the capabilities[4] identified in the NAS NAV Strategy. In addition, without certain aircraft capabilities, the benefits of the FAA's iTBO implementation plan may be limited. These aircraft capabilities extend beyond navigation, and include data provision and collaboration ability, data communications, and time of arrival control.

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[4] From discussion with FAA NextGen Director of Portfolio Management & Technology Development, and MITRE NextGen Equipage inventory, August 2018

Previous benefit studies have been done by industry and the FAA for specific aircraft capabilities or infrastructure upgrades. There is an urgent need for a holistic study of both industry and FAA benefits resulting from a harmonized deployment of aircraft capability, iTBO infrastructure, and PBN procedures, inclusive of data communications, navigation, and surveillance capabilities.

Recommendation: A comprehensive FAA and industry approach should be undertaken that includes benefits resulting from a combined ground and airborne technology implementation schedule.

Procedures Gateway Transparency

Previous rolling plan accomplishments have been possible through successful Industry and FAA collaboration. The NIWG members desire to continue that success, and it is important to note that transparency and accountability for commitments is essential. It is understood that balancing requests for PBN improvements with available resources is a continual challenge. Additionally, as constraints limit the FAA's ability to respond to requests, transparency regarding the status of each project after it is logged into the Instrument Flight Procedure (IFP) Gateway remains a high interest.

Communications and coordination challenges have frustrated Industry proponents. Issues include inability to schedule meetings, delays in publishing amendments, or work conducted without necessary industry involvement[5]. Rationale for delays or schedule changes should be communicated to proponents and other stakeholders to minimize misperception and increase confidence in existing processes.

The development and implementation progress should be tracked consistently and made available to stakeholders in a timely manner through the IFP Gateway. Key characteristics of a more transparent method of communication that would enable proponents (e.g. operators, airports, facilities, communities, others) and service providers/designers to have more productive and meaningful exchanges include:

- Automatic and electronic notification to the proponent on status changes as a procedure progresses along the development life-cycle
- Opportunity to understand decisions and associated circumstances that may delay, reprioritize or conclude that a procedure is not viable

Recommendation: Industry recommends the FAA pursue a system that automatically and electronically, if possible, informs proponents of status changes as a procedure progresses along the development life cycle.

Post Implementation Reporting

The establishment of PBN milestones is a combination of desired industry outcomes balanced with the FAA's business plans and available resources. Industry plays a key role in assessing operational benefits after a milestone has been implemented. This validates the planning and execution of the intended goals which should be established and agreed upon by stakeholders prior to implementation.

Industry stakeholders, including operators and airports, have important perspectives, feedback, and sometimes data that are necessary inputs to the post-implementation process. While an individual stakeholder may have limited access to the tools and resources needed for a comprehensive post-implementation analysis, they should make every effort to collect relevant data and contribute their

[5] Examples include MDW STARs, SNA STAR, CLT STARs, and EGE SID.

findings as part of the validation process. Industry should have access to post-implementation reports developed by the FAA and their support such as MITRE, ATAC or other relevant resources, and should assist in validating the data, results, and conclusions of those reports. Full accounting of benefits and consequences of implemented procedures should be part of post-implementation reporting. Industry should have the ability to review and concur with analysis findings and conclusions. If the findings are negative, the post-implementation process needs to support modification or suspension of the effort, if needed.

Industry Commitment: Industry will provide input, validate data, review findings and confirm conclusions to post-implementation analyses for implemented PBN procedures, within 6 to 12 months of the completed implementation.

Track-to-Fix

The previous PBN Rolling Plan established milestones to enable wider participation of EoR with the following recommendations:

- EoR with Radius-to-Fix (RF), EoR with Track-to-Fix (TF), assessment of TF/RF Concurrent Operations
- RF to xLS (RF/TF) – Assessment/identification of pre-implementation milestones

The PBN NIWG Track-to-Fix EoR milestones from the previous PBN NIWG plans had been held in abeyance and were closed due to concerns raised by aircraft lacking vertical navigation guidance (VNAV) capabilities resulting in potential increased risk of Controlled Flight into Terrain (CFIT) in the final approach segment.

The PARC (Performance-Based Aviation Operations Rulemaking Committee) Navigation Workgroup has taken on the technical task of solving the problem of RNAV to xLS transitions on the final segment. The recommendations from the Nav WG should mitigate CFIT by using the ILS for some EoR applications. Advisory VNAV is another tool under discussion for non-VNAV aircraft. A significant amount of data collected and reviewed from many types of aircraft flying arrivals in Atlanta Hartsfield International (ATL) using a "closed" PBN trajectory from the downwind to the runway indicated a high level of vertical performance from aircraft equipped solely with advisory (no coupled) vertical guidance capability. All parties agreed that a search of the Aviation Safety Information Analysis and Sharing (ASIAS) database should be completed to determine what data might be available for aircraft flying similar "closed" PBN trajectories using advisory vertical guidance capability.

The findings and report are currently pending. Other concerns related to risk analysis and closely-spaced parallel operations are part of the discussion, but no specific outcomes have been agreed to. The Nav WG will continue its technical effort, addressing the remaining research items and develop additional mitigation options. Other data collection efforts (e.g. Fort Myer) may also contribute to the Nav WG deliberations.

Recommendation**:** The FAA should:

- Complete the investigation of available ASIAS data and conduct a review with requisite stakeholders to understand the capability and sufficiency of Advisory VNAV to address the expressed CFIT concerns.

- Continue coordination and work with the PARC on TF to xLS and obtain consensus towards mitigating CFIT concerns.
- Continue dialogue with stakeholders to an agreeable path forward for risk analysis and acceptable parallel operations for non-VNAV aircraft.
- Revisit previous TF milestones and determine next steps.
- Dependent on the outcomes of the PARC Nav WG, consider a single runway application at Las Vegas using RNAV to ILS transition.

Advanced RNP

Advanced RNP (A-RNP) offers key benefits provided by RNP, including RF (Radius -To-Fix) curved paths but without some of the certification costs and regulatory requirements. This offers an attractive option for operators with RF capability on various legacy fleets that are not RNP AR. A-RNP can be leveraged for arrival and departure procedures as well as instrument approaches and approach transitions.

The first A-RNP SID, the APRES (Uh-prā), was recently published for Eagle County Regional Airport (KEGE) in Eagle, Colorado. The procedure lends itself well in meeting the terrain challenged environment at EGE. The RNP .3 containment and RF turns provide a reduced climb gradient and lower takeoff weather minimums than the existing procedures. The development and implementation of the procedure identified a lack of complete understanding of A-RNP criteria and operations approval. Flights have begun to use this procedure and experience gained from those flights will be collected and shared. Figure 1 and Figure 2 show the procedure plate and initial flight path associated with the procedure.

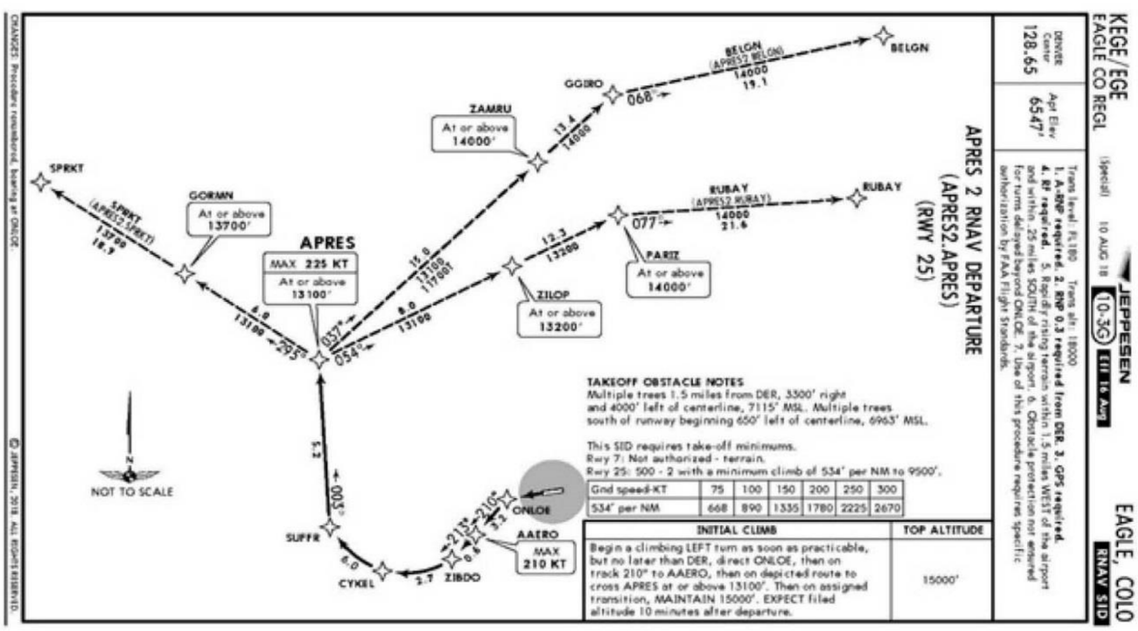

Figure 5: APRES A-RNP SID

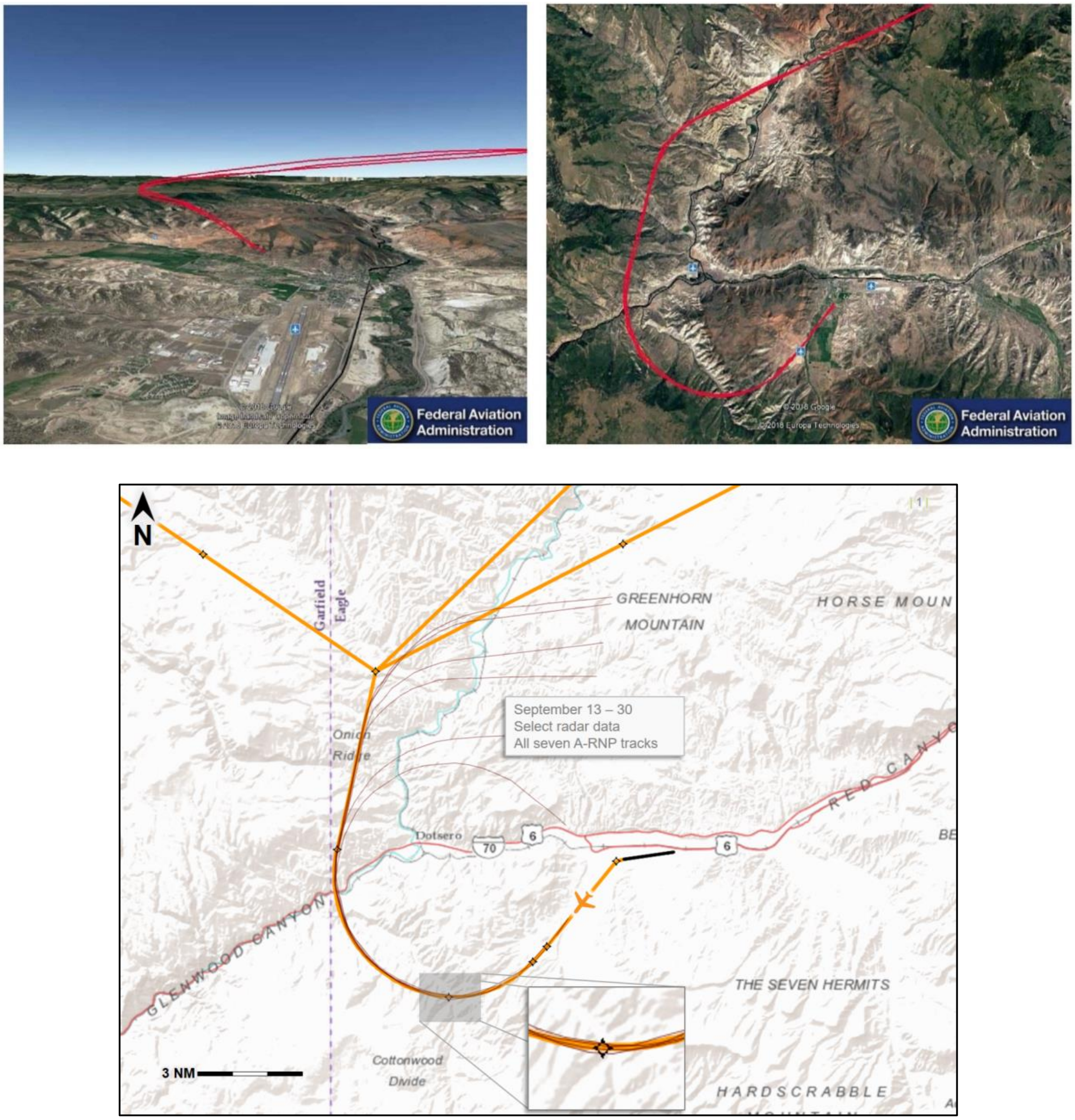

Figure 6: Flight Tracks for APRES A-RNP SID

Recommendation**:** The FAA (AFS and PBN Office) and PARC should:

- Capture lessons learned from Eagle and apply them to subsequent A-RNP initiatives.
- Determine if current criteria, operations approval guidance are easily understood and applied by the stakeholders
- Establish milestones and identify key sites for deployment of A-RNP to include STARs, SIDs and Approaches where it can result in measurable operational efficiency gains.

GBAS/GLS

Industry is asking for a clear plan for GLS Operations, including near-term authorization for Category II minimums and eventual evolution to full Category III. Industry equipage is growing rapidly and concerns about a "mixed equipage" environment can be overcome by designing key instrument approach procedures in a terminal area, including transitions, using the same basic path, whether RF or TF based, or straight-in. Ideally, from a controller's perspective, the only distinguishing factor among the procedures (ILS, GLS, LPV, RNAV, or RNP) would be the minimums. Certification and approval of Category II and ultimately Category III with GLS would allow the approaches to be used simultaneously and transparently on existing Category II/III runways. It may also allow extension of Category II/III capability to runways where it does not currently exist without investment in new ILS equipment. At several NSG-1 and 2 airports, as noted below, GBAS can be used to support precision approaches where none are currently available, achieving a key industry objective of precision approach guidance to all air carrier runways. There is also growing interest at airports in the potential noise benefits of GBAS due to its lateral, longitudinal and vertical flight path capabilities.

The PBN NIWG Team is waiting for the release of an internal FAA paper clarifying the FAA's plan for this program. Industry believes that GBAS offers operational benefits to the user as well as the FAA in terms of system availability and reliability. It also will contribute to the long-term cost reduction of maintaining and replenishing the existing ILS infrastructure. Note that the FAA's commitment to GBAS was memorialized in the PBN NAS Navigation Strategy[6].

Sites of interest for the industry are EWR, LGA, JFK, BOS, ORD, SFO and SEA. Examples of GBAS applications and potential benefits are:

- Newark (EWR):
    - Develop an approach to Runway 29, which could mimic the current GPS X Runway 29, RNAV (RNP) Y Runway 29, and RNAV (RNP) Z Runway 29, but provide a straight-in final approach with vertical guidance. This runway is used to provide critical arrival capacity to accommodate demand under certain wind and weather conditions and minimizes holding or the need for a ground delay program.
    - Develop a curved path approach to tie into the current GLS to Runway 11 using RF and TF leg types.
    - Develop approaches to runways 4L and 22R to permit use as overflow runways in various weather conditions. Existing procedures are being revised to support a .308 operation.
- New York LaGuardia (LGA):
    - Potential for improved minimums to runways 31 and addition of GLS approach with vertical guidance.
    - Development of approaches that de-conflict the JFK and LGA airspace (LGA Runway 31 and JFK Runways 22L/R).
    - Develop approaches using RF and TF legs to Runway 13 that can turn final within the confines of LGA airspace and de-conflict EWR, TEB and LGA. Aircraft from the south

[6] Page 14 and 15 from *PBN NAS Navigation Strategy 2016*:"… FAA will support the delivery of benefits from the operation of the non-Federal GBAS facilities by approving new facilities, developing and publishing GLS approach procedures, training controllers, and providing flight inspection services. FAA is also supporting the development and approval of Cat II/III GLS capability which is expected to be available late in the near term."

would save approximately flying 15 miles compared to the current ILS approach to Runway 13.

- New York John F. Kennedy (JFK):
  - Potential for improved minimums to Runway 13R, which has no ILS, as well as developing offset approaches to runways 4L or 4R, allowing simultaneous independent approaches to these runways.
  - Develop a straight-in approach (ILS is offset) to Runway 22R (improved minimums over the offset approach) and parallel RF and TF leg approaches to runways 13L and 13R.
- Boston (BOS):
  - Conduct an evaluation of potential GBAS procedures and quantify the expected benefits related to redundancy/sustainability, noise abatement and improvements in safety/throughput. Provide precision approach to runway 4L to be used independently or to support 7110.308 procedures.
  - Use the results to inform an airport investment decision for a GBAS ground station.
- Chicago O'Hare (ORD):
  - Provide glide slope and better minimums on runway 4L, offset approach to 28L to conduct simultaneous arrivals, and Cat II backup all runways
  - GBAS is not affected by snow or critical areas which impact taxi routes
- San Francisco (SFO):
  - Provide precision approaches to non-ILS runways 19R, 10L/R. Also provides critical area benefits and back up for ILS
- Seattle-Tacoma (SEA):
  - The Port of Seattle is considering an airport investment decision for a GBAS ground station.
- During severe weather events, hurricanes or extreme flooding, GBAS antennas can be removed, stored, and reinstalled when the weather has improved. GLS approaches have been available and used during snow and ice events at EWR when the ILSs have frozen and were NOTAMed out of service.
- GBAS enables staggered thresholds for noise relief and higher glideslope angles up to autoland limits for potential obstacle clearance. An SFO trial of RNP to GLS showed 46 percent less fuel and 86 percent less noise impact, according to a 2018 Boeing briefing at a University of California-Irvine noise conference.
- As equipage increases, other airports such as Chicago Midway (MDW), DEN, Houston Hobby (HOU), AUS, and BNA will also see similar benefits.

Recommendations: The FAA should:

- Ensure the level of support for GBAS is in accordance with the spirit and guidance in the PBN NAS Navigation Strategy
- Support GLS Category II operational approval, either as a fully certified Category II system, or by authorizing Category II operations on existing Category I systems, thereby leveraging GBAS all-weather capability
- Study the feasibility of using the flexibility of GLS procedures for noise abatement by evaluating higher GP angles not to exceed autoland limitations, and alternative touchdown points.
- Partner with airports and industry to support training and advanced procedure development and ensure procedures are flyable by all aircraft to minimize the impacts of "mixed equipage."
- Support future industry investments in GBAS Category III ground and airborne systems.

NSG 1 Airports and Metroplex

NSG 1 airports have some of the most complex conditions in the NAS. In addition to being among the busiest airports, they are also generally in crowded metropolitan areas and are served by many different operators with varying degrees of technology on their aircraft. Demand at these airports is high and while some NSG 1 airports have ample runways and ample spacing between runways, many do not. PBN procedures at these airports should reduce pilot/controller workload and increase schedule reliability/efficiency without reducing airport capacity. PBN work at these airports should consider equipage mix, alignment with ATC tools, and runway configurations. Deconfliction between primary and secondary airports is also a primary consideration for many of the NSG 1 airports.

The FAA continues to improve overall NAS efficiency by implementing PBN at selected metropolitan areas, or in a metroplex, which has multiple airports and complex air traffic flows. Through the Metroplex program, the FAA collaborates with aviation and community stakeholders to improve regional traffic movement by optimizing airspace and procedures built on precise satellite-based navigation. As the Metroplex effort completes the final four sites, lessons learned throughout the whole Metroplex project should be accumulated and shared. Post-implementation analyses should include measurement of the implemented procedures against the expected project benefits.

<u>Implementation Commitments</u>: Note Environmental Assessment work has been paused since December 2017 for Denver, Las Vegas and Florida; thus, milestones are dependent on completion of environmental work.

Cleveland/Detroit
- Implementation phase complete, Q4 CY18
- Post-implementation phase complete, Q3 CY19

Denver
- Implementation phase start, Q4 CY19
- Implementation phase complete, Q1 CY20
- Post-implementation phase complete, Q4 CY20

Las Vegas
- 100 percent design complete, Q2 CY19
- Implementation phase start, Q2 CY20
- Implementation phase complete, Q3 CY20
- Post-implementation phase complete, Q2 CY21

Florida (SIDs and STARs)[7]
- 100 percent design complete, Q2 CY19
- Implementation phase start, Q3 CY20
- Implementation phase complete, Q2 CY21
- Post-implementation phase complete, Q4 CY21

NSG 5 Airports and Heliports

In reviewing NSG 5 airport and heliport PBN goals, implementing vertical navigation to more landing surfaces was determined to bring near-term safety and operational benefits and improve the business case for individual operators to equip with PBN capabilities. The new U.S. Standard for Terminal Instrument Procedures (TERPS) criteria that facilitates additional LPV approaches to terrain and

[7] High altitude PBN routes associated with the Florida Metroplex will start implementation in Q4 CY18.

obstruction-challenged airports should be implemented at more locations. An example is Medford, OR, where terrain limits approaches from the south. General aviation would benefit from new TERPS criteria at this location if an LPV was implemented.

Recommendation: The FAA should prioritize implementation of additional LPV approaches to terrain and obstruction-challenged airports, with appropriate resources and timelines. The FAA also should work with the helicopter community to further refine the execution of the PBN NAS NAV Strategy for heliports. The NSG for heliports is not listed, which appears to limit the development and prioritization of public PBN procedures to these locations.

Risks/Challenges

The NIWG identified the following risks as critical to implementing PBN and iTBO between CY2019 and the end of CY2021. Key risk factors are:

- Balancing of aircraft equipage capabilities
- Community acceptance of changes in procedures
- Controller decision support system tools to accommodate and leverage PBN procedures and equipage.

Balancing of Aircraft Equipage Capabilities

The PBN NIWG Team recognizes the need for a transition period to provide near-term benefits for highly capable aircraft (as defined by 2025 in the NAS Navigation Strategy) while including less-capable aircraft. The team has a strategy to accommodate aircraft of limited existing capability at selected Navigation Service Group (NSG) 1 airports. A more “forward leaning” strategy is being applied by working to ensure more consistent use of PBN procedures at NSG 2-4 airports operations that will provide benefits to highly capable aircraft.

The more than 2,400 general aviation-centric NSG 5 airports as well as instrument flight rules (IFR) heliports also should be approached with a “forward leaning” attitude. Increasing the number of approaches with vertical guidance to terrain and obstruction-challenged landing surfaces would improve the business case for operators to equip with PBN capabilities. The PBN NIWG Team recognizes the need for increasing the number of localizer performance with vertical guidance (LPV) procedures at these locations, as called for by the PBN NAS Navigation Strategy.

Community Involvement

Important elements for successful implementation of PBN initiatives will be the communication, affirmation of the need for change and the support of all stakeholders. The FAA and operators of aircraft and airports recognize that a key step is engagement with local communities. The NAC PBN Blueprint Community Outreach Task Group report approved by the NAC in 2016 included findings for effective community outreach. It stated that community outreach is the combined responsibility of the FAA, Airports, and Aircraft Operators. The report highlights the essential role of airports in PBN implementation with a unique and critical perspective of community interests. PBN Blueprint Community Outreach report findings are reflected in the *FAA Community Involvement Manual*[8], which

[8] The FAA Community Involvement Manual was published in 2015 and is available at https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/guidance/media/faa_cim.pdf

describes the high-level framework and processes for involving the community. For PBN procedure development, the FAA emphasizes several key points:

- Airport and airport operators, and the FAA are critical partners in explaining PBN initiatives and benefits, and in communicating with stakeholders throughout the community involvement process.
- The level of community involvement will be tailored to the initiatives under consideration and the potential impact of those specific initiatives.
- Communication with elected officials, local agencies, the public, and other stakeholders on project status will be timely and ongoing. Comments and feedback on specific initiatives from all stakeholders will be considered to inform decision making and project refinements.

Community involvement is an essential element in the PBN implementation process, but it does not reduce, negate or replace the environmental review requirements under the National Environmental Policy Act. As noted in the *FAA Community Involvement Manual*, community involvement activities parallel those in the environmental review process.

Experience has shown that successful PBN implementation efforts typically have established outreach long before beginning the PBN procedure development process. Early engagement at multiple levels can ensure an understanding of the need for PBN and what it may mean to the community. Although the FAA leads in community involvement, PBN success depends upon all stakeholders fulfilling their roles and responsibilities in a collaborative and coordinated manner throughout the entire PBN implementation process. With their understanding of community interests, airport operators play an important role in the collaborative PBN process, especially during the design phase. As specific opportunities are identified, airport and aircraft operators, and the FAA will need to jointly participate in PBN community involvement efforts. FAA leadership has stated that positive advocacy from key operational stakeholders is a critical element for PBN success. While every stakeholder may not agree with every procedure, consistent messaging is essential.

Decision Support Tools/Aircraft Based Tools

The NAC recognized the criticality of controller decision support system tools in the October 2016 report on PBN time, speed, and spacing[9]. The recommendations in that report stressed the need for a strategy for the time, speed and spacing assignment will address what types of tools are appropriate in various operating conditions, what tools should be identified as high priority, and how the various capabilities can be integrated into efficient traffic flow management. This is fundamental to the successful implementation and operation of PBN across the NAS and is essential to ensuring more efficient traffic flows that fully leverage available system capacity. The NIWG endorses the move to iTBO and supports the tools outlined as part of the TBO vision.

Performance Indicators and Success Criteria

Proposed PBN performance indicators focus on expected outcomes for airlines and airspace users from implemented PBN procedures when combined with necessary aircraft equipage and the appropriate ATC airspace management tools. Successful PBN implementation is site-specific, and the indicators should be defined based on the operational uniqueness of each implementation and tie back to the operational objective of the PBN implementation. These goals have broadly included:

[9] "PBN Time, Speed, Spacing Task Group" recommendation approved by the NextGen Advisory Committee, October 2016.

- Maintaining or increasing airport or airspace throughput
- Efficiency of continuous climb and descent procedures to fit the operation
- Most efficient approach procedure that the operation can support
- Support to move toward implementation of initial TBO and use of controller decision support systems

Based on previous PBN implementation and post-implementation assessments conducted by the Joint Analysis Team[10], PBN implementation success has generally been defined as reduced flight time, including taxi-out times for departures. Reduced flight times are driven by either shorter flight paths, increased use of available capacity, or in some cases increased arrival/departure capacity. Measurement of changes in flight distance and capacity requires proper normalization for runway configurations, weather and demand.

Specific success criteria depend on the airport, runway configuration, runway usage and airspace. These scenarios illustrate the efficiency benefits of a PBN implementation but are not comprehensive:

- Scenario 1: Individual airports with PBN arrival procedures
  Indicators: Reduced flight distance, time or both; increased arrival throughput (if applicable)
- Scenario 2: Individual airports with PBN arrival and departure procedures
  Indicators: Reduced flight distance, fuel burn and time; increased throughput or peak capacity (if applicable)
- Scenario 3: Multiple nearby airports with PBN arrival and departure procedures
  Indicators: Increased arrival/departure throughput through deconfliction, decreased taxi out delay, and reduced flight distances/time flown for arrivals and departures

Along with efficiency, PBN implementations may also satisfy other operational needs, such as safety, access and environmental issues. Examples of PBN efforts associated with those objectives:

- Area navigation standard instrument departures (RNAV SID) at Teterboro for access (Northeast Corridor commitment)
- Gary PBN procedures for safety (PBN NIWG joint commitment implemented in 2017)
- STAYY1 RNAV SID for noise reduction at John Wayne Orange County using RF coding (implemented with Southern California Metroplex in 2017)

PBN success also can be represented through output-oriented metrics that complement the outcome-oriented metrics, such as reduction of flying distance and reduction of block time. Measuring the use of a PBN procedure can reflect the successful transition from conventional procedures. This can be accomplished by calculating the percentage of conformance of flight tracks to the published PBN procedure. While this type of output metric may not singularly reflect the purpose of a procedure, nor is not easy to monetize, it can indicate the shift in the operation. Predictability, with elimination of variances and delivery of precise, repeatable paths, is an important benefit of PBN.

[10] The Joint Analysis Team (JAT) is an FAA-Industry collaborative team that evaluates the operational benefits from NextGen implementations.

PBN NIWG Milestones

Milestone	FAA or Industry	Type	Milestone/Commitment	Milestone Date Q/CY
Initial Trajectory Based Operations and PBN Harmonization	FAA	 I I I	Implement select iTBO capabilities that will enable more precise trajectory management, collaborative scheduling, and repeatable PBN procedures; together designed to increase use of existing capacity, improve operational predictability and flexibility, and enhance flight efficiency: • In the Northeast Corridor • At an additional operating area (Northwest Mountain – Denver) • At an additional operating area (Southeast – Atlanta)	 4Q2021 4Q2020 4Q2021
Understanding and Addressing the Barriers to Established on RNP	FAA	P	The **FAA** will lead an effort partnering with Industry to analyze potential constraints and causes that inhibit the consistent use of EoR procedures at select NSG 1-4 airports in the NAS by Q1 CY20. Industry's broad expertise will contribute important perspectives and experience to this effort. This analysis will also recommend next steps to address the identified constraints and causes. The scope of this analysis includes, but is not limited to: procedure criteria, separation standards, and merging/spacing needs. Three airports selected from the six candidates will be analyzed, representative of NSG 1-4 airports.	1Q2020
Understanding and Addressing the Barriers to Established on RNP	Industry	I	**Industry** will identify the three airports for detailed analysis. The FAA and its support may provide analysis and data to inform Industry decision.	4Q2018
Post Implementation Reporting	Industry	I	**Industry** will provide input, validate data, review findings and confirm conclusions to post-implementation analyses for implemented PBN procedures, within 6 to 12 months of the completed implementation.	within 6 to 12 months of the completed implement-ation

Milestone	FAA or Industry	Type	Milestone/Commitment	Milestone Date Q/CY
NSG 1 and Metroplex	FAA	I I	Cleveland/Detroit • Implementation phase complete • Post-implementation phase complete	4Q2018 3Q2019
NSG 1 and Metroplex	FAA	I I I	Denver • Implementation phase start • Implementation phase complete • Post-implementation phase complete	4Q2019 1Q2020 4Q2020
NSG 1 and Metroplex	FAA	P I I I	Las Vegas • 100 percent design complete • Implementation phase start • Implementation phase complete • Post-implementation phase complete	2Q2019 2Q2020 3Q2020 3Q2021
NSG 1 and Metroplex	FAA	P I I I	Florida (SIDs and STARs) • 100 percent design complete • Implementation phase start • Implementation phase complete • Post-implementation phase complete	2Q2019 3Q2020 2Q2021 4Q2021

Key: P – Pre-implementation milestone
I – Implementation milestone

PBN NIWG Recommendations

Initiative	Recommendation
1. Consistent and Sustainable Funding for PBN Implementation	The FAA should develop a multi-year capital implementation plan for PBN that serves as a roadmap for the completion of the 2016 NAS NAV Strategy. The plan should be resourced appropriately to support the PBN transition described in the strategy document.
2. Understanding and Addressing the Barriers to Established on RNP	The FAA and Industry should assemble a collaborative group to evaluate how to overcome the set of barriers studied in the FAA Pre-Implementation Milestone. This multi-disciplined group will consider how to resolve the full set of barriers, to enable widespread deployment of EoR operations, with a particular need for advanced deployment timelines at NSG 2 and NSG 3 airports.
3. Holistic Approach for Aircraft Equipage	A comprehensive FAA and industry approach should be undertaken that includes benefits resulting from a combined ground and airborne technology implementation schedule.
4. Procedures Gateway Transparency	The FAA should pursue a system that automatically and electronically, if possible, informs proponents of status changes as a procedure progresses along the development life cycle.
5. Track-to-Fix	The FAA should: • Complete the investigation of available ASIAS data and conduct a review with requisite stakeholders to understand the capability and sufficiency of advisory VNAV to address the expressed CFIT concerns. • Continue coordination and work with the PARC on TF to xLS and obtain consensus towards mitigating CFIT concerns. • Continue dialogue with stakeholders to an agreeable path forward for risk analysis and acceptable parallel operations for non-VNAV aircraft. • Revisit previous TF milestones and determine next steps • Dependent on the outcomes of the PARC Nav WG, consider a single runway application at Las Vegas using RNAV to ILS transition.
6. Advanced RNP	The FAA (AFS and PBN Office) and PARC should: • Capture lessons learned from Eagle and apply them to

	subsequent A-RNP initiatives. • Determine if current criteria, operations approval guidance are easily understood and applied by the stakeholders • Establish milestones and identify key sites for deployment of A-RNP to include STARs, SIDs and Approaches where it can result in measurable operational efficiency gains.
7. GBAS/GLS	The FAA should: • Ensure the level of support for GBAS is in accordance with the spirit and guidance in the PBN NAS Navigation Strategy • Support GLS Category II operational approval, either as a fully certified Category II system, or by authorizing Category II operations on existing Category I systems, thereby and leveraging GBAS all-weather capability • Study the feasibility of using the flexibility of GLS procedures for noise abatement by evaluating higher GP angles not to exceed autoland limitations, and alternative touchdown points. • Partner with airports and industry to support training and advanced procedure development and ensure procedures are flyable by all aircraft to minimize the impacts of "mixed equipage." • Support future industry investments in GBAS Category III ground and airborne systems.
8. NSG 5 Airports and Heliports	The FAA should prioritize implementation of additional LPV approaches to terrain and obstruction-challenged airports, with appropriate resources and timelines. The FAA also should work with the helicopter community to further refine the execution of the PBN NAS NAV Strategy for heliports. The NSG for heliports is not listed, which appears to limit the development and prioritization of public PBN procedures to these locations.

Surface and Data Sharing

Executive Summary

The Surface and Data Sharing NextGen Integration Working Group (NIWG) has successfully delivered against the commitments made in the 2014 Joint Implementation Plan, the NextGen Priorities October 2015 Update, as well as the CY2017-CY2019 Surface NIWG Rolling Plan. To continue building upon this success, the NIWG has developed a follow-on set of focal areas and commitments related to maximizing surface-related benefits from the upcoming implementation of the Terminal Flight Data Manager (TFDM) as well as data sharing. These focal areas, along with Collaborative Decision Making (CDM) Steering Group (CSG) tasking, support continuity and connectivity with the Surface Collaborative Decision Making (S-CDM) Concept of Operations, and seek to further enhance data exchange between FAA and all aviation stakeholders. The group is focused on advancing data driven traffic flow management (TFM) across the NAS with an emphasis on the data and connectivity requirements for NAS automation systems.

Background

In 2016, collaboration between Industry and the FAA as part of the Surface NextGen Integration Working Group (NIWG) led to surface traffic management and data sharing recommendations as well as commitments to meet those recommendations by both Industry and FAA. The areas of focus for the recommendations built upon Task Force 5, whose own recommendations were founded upon information sharing and situational awareness of airport flight movement activity.

The 2016 recommendations focused on implementation of the following:

- Terminal Flight Data Manager (TFDM) program
- Data sharing among FAA, flight and airport operators
- Establishment of a forum for ongoing industry engagement with FAA regarding System Wide Information Management (SWIM) data, decision support tools and National Airspace System (NAS) automation, processes, procedures and policies

The collaborative Surface NIWG activity has led to successful progress on all three of these focal areas. The TFDM Program has been launched; operators are sharing key operational data elements with the FAA; and the System Wide Information Management (SWIM) Industry-FAA Team (SWIFT) forum was launched in 2017.

The TFDM Program has no industry dependencies through 2020 aside from preparation for Build 2. For the Build 2 capabilities to be deployed in 2021, TFDM requires flight operator and /or airport authorities (where the airport authority runs the ramp tower) to subscribe to the TFDM Terminal Publication (TTP) Service via SWIM to accomplish the data exchange necessary for successful implementation of the TFDM system.

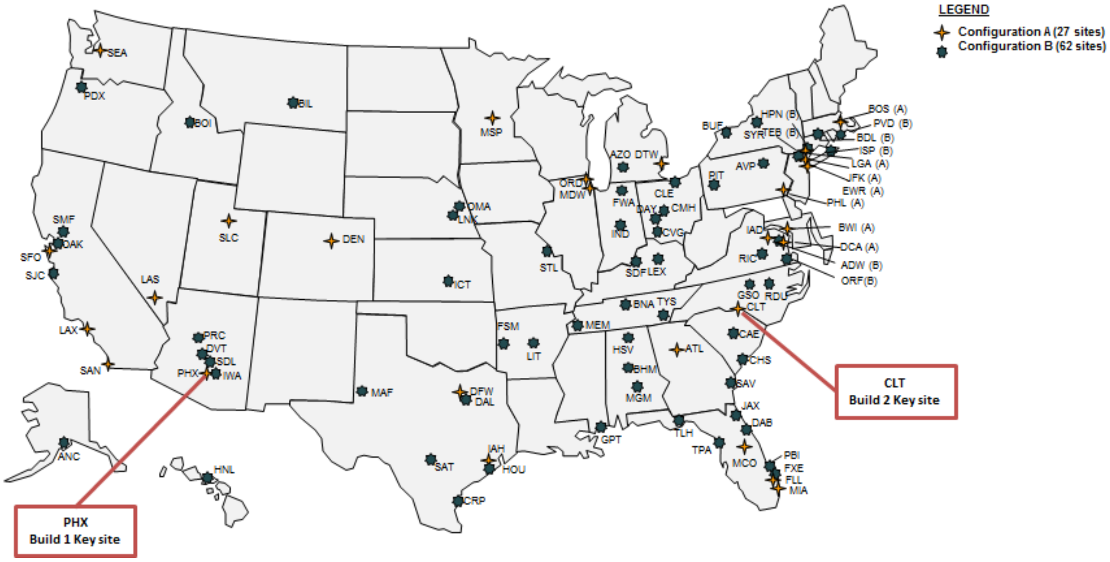

Figure 7 TFDM Implementation Sites by Configuration

It is important to note the expectation that internal and individual industry business case development will be necessary, along with a benefits and risk review, in order for industry to invest in the connection to TTP and other SWIM feeds. Critical to industry business case development is an understanding of what information is available through TTP and other SWIM feeds and the operational context of this information, in order to discern the use of that data in achieving operational benefits.

Some industry discussion around business case development has included concepts such as possible government provision of software as well as hardware to view, manage and operationally integrate TFDM data and procedures into industry operations. FAA and industry agree that NASA ATD-2 activities should be leveraged to the greatest extent possible to support this connectivity and data integration effort.

All FAA and industry commitments and milestones have been completed from the CY2017-CY2019 Surface NIWG Rolling Plan. For complete detail on the status of the current rolling plan, please see the FAA's webpage for "NextGen Priorities – Surface Operations and Data Sharing" at https://www.faa.gov/nextgen/snapshots/priorities/?area=sops.

To continue building upon the successful planning and implementation resulting from the CY2017-CY2019 recommendations referenced above, the NIWG has developed a follow-on set of focal areas for surface and data sharing. These are described in the next section, which provides the foundation for the CY2019-CY2021 plan.

Implementation Plan

Recommendation 1: Support the implementation of TFDM into the NAS to maximize available benefits

- Need to understand SWIM TTP and TFCS connection requirements and the benefits/costs required for implementation

    - Understand data/message types, operational context of the data/information services and technology requirements

- Leverage the benefits to operators included in the TFDM business case information provided in 2018 for industry's business case
- Evaluate the risks of mixed-participation, and associated potential reduction of benefits
- Collaboratively develop policies, procedures, processes, and training
- Promote involvement of all stakeholders (e.g., airlines, airports, business and general aviation, international operators, etc.)
- Expect multiple solutions by operators and airports at different locations - may use vendors to provide connectivity, may involve greater integration in hubs vs spokes
- Industry recognizes that flight operators that are not currently U.S. Collaborative Decision Making (CDM) participants (e.g., foreign flag carriers, regional airlines, recent entrant domestic carriers) and airport operators may have increasingly important roles to play in providing timely operational data (e.g., earliest off block times) to support TFDM and future TBO capabilities.
- Plans to engage these non-CDM participants and establish mechanisms for them to share these operational data need to be established and implemented rapidly and should be aligned with the TFDM implementation "waterfall".
- Airports in this waterfall that serve large numbers of non-CDM operations—whether international carriers, non-CDM domestic carriers, or general aviation—should be identified for early coordination activities to establish (1) what entities will provide non-CDM participant operational data, (2) the mechanisms by which these data will be shared with the FAA and others in industry, and (3) policies, procedures, and technology that need to be implemented to effect this data exchange.
- Ideally, these coordination activities should be integrated with the Collaborative Site Implementation Team (CSIT) outreach activities planned over the course of the TFDM implementation waterfall; note: CSIT visits are planned between 12-18 months prior to each site implementation.

Recommendation 2: Support successful NASA ATD-2 Technology Transfer to facilitate TFDM implementation

- Leverage NASA-issued Notice of Opportunity to identify requirements for successful tech transfer to industry
- Leverage NASA ATD-2 Investments to maximize NAS Benefits for TFDM and iTBO/TBO
- Reinforce commitment to NASA ATD-2 technology / knowledge transfer through active NIWG support
    - Format and parameters of transfer
    - Technology transfer to FAA
    - Technology transfer to industry
        - Open source opportunities

Recommendation 3: Enhance data exchange between the FAA and all aviation stakeholders

- Data exchange supports:
    - The TBO/iTBO concept
    - TFMS, TBFM, TFDM and other NAS automation programs
    - Use of trajectory option sets (TOS) to enable timely provision and updates to industry route preferences when FAA systems are properly configured to receive and manage alternatives
    - Data driven Traffic Flow Management
- SWIM Industry-FAA team (SWIFT), CDM, and similar organizations should be leveraged to the greatest extend possible. Non-CDM operators, airports, and other stakeholder participation should be inclusive.
    - SWIFT establishes a community forum that acts as a single environment for collaborative communication and engagement around information and data sharing for the FAA. It offers a unique and evolving community outreach platform to discuss the FAA data and information services to the external community.

Recommendation 4: Common industry/FAA metrics and maximizing use of 'big data' to inform data-driven decision making

- Use of the term 'big data' in this document refers to the analytical process of taking multiple data sources and tabulating trends and predicting benefits as well as impacts
- The use of common industry/FAA metrics supports collaboration between FAA, industry, airport authorities (and other stakeholders) toward successful surface departure management
    - Surface departure metering is a highly collaborative process, and is an integral part of the iTBO "gate to gate" concept
    - Use of a common set of metrics encourages all stakeholders to participate in meetings to collaboratively assess/review/critique surface management
- The set of metrics that were put forward by the Joint Analysis Team (JAT) and approved by the NextGen Advisory Committee (NAC) in June of 2015 should be leveraged. These metrics are "intended for the FAA and industry to collaboratively monitor performance to understand the impact of implementations" (*citation from:* https://www.faa.gov/nextgen/snapshots/priorities/jat/media/JAT_BOS_GYY_OPDs_Datacomm_Report.pdf) of the four key NIWG capabilities described in the *NextGen Priorities Joint Implementation Plan* of October 2014, and include:
    - Three metrics to be measured by city pairs:
        1. Actual Block Time
        2. Actual Distance Flown
        3. Estimated Fuel Burn
    - Three metrics to be measured at airports:

4. Throughput – Facility Reported Capacity Rates
5. Taxi-Out Time
6. Gate Departure Delay

- Collaboration between Surface and Data Sharing NIWG with JAT as needed to understand how FAA / industry agreed to calculate these metrics, and suggest additional metrics if appropriate
- *Note:* The SWIFT forum may be used to address "operational context" considerations of the information available over SWIM, and associated implications to operational metrics.
    - The SWIFT should continue to evolve and engage with industry to address needs and concerns about information and relevant operational metrics, and associated FAA data sharing and information services to the aviation industry.

Risks

- Operator/airport timing of connectivity/access to SWIM TFDM Terminal Publication (TTP) Service
- Operator timing of connectivity/access to SWIM TFDM FOS Collaboration Services (TFCS), to allow for departure substitutions during surface departure metering
- Process for integration of data and operational decision making to meet TMAT times by all operators (U.S. airlines, foreign carriers, general and business aviation) and impact of gate usage

Surface NIWG Milestones

Milestone	FAA or Industry	Implementation (I) or Pre-implementation (P)	Milestone Date Q/CY
FAA Milestones: CY2019			
- Q4: The TFDM Program will complete the Operational Testing for Build 1	FAA	P	4Q2019
- Q4: NASA ATD-2 Interim technology transfer from *Phase 2: Fused IADS* at CLT	FAA	P	4Q2019
CY2020: - Q1: The TFDM Program will achieve the key site Initial Operating Capability (IOC) for Build 1 at PHX	FAA	I	1Q2020
- Q3: The TFDM Program will achieve the In-Service Decision (ISD) for Build 1 to allow additional TFDM system deployments into the NAS	FAA	P	3Q2020
- Q3: NASA ATD-2 Final technology transfer from *Phase 3: Terminal Departure IADS* at Dallas	FAA	P	3Q2020
- Q4: The TFDM Program will achieve IOC at 3 additional sites	FAA	I	4Q2020
CY2021:			
- Q1: The TFDM Program will achieve the key site Initial Operating Capability (IOC) for Build 2 at CLT	FAA	I	1Q2021
- Q3: The TFDM Program will achieve the In-Service Decision (ISD) for Build 2 to allow additional deployments of the full TFDM system capabilities into the NAS	FAA	I	3Q2021
- Q4: The TFDM Program will achieve IOC at 9 additional sites	FAA	I	4Q2021
Industry Milestones:			
CY2019			
- Q3: Review TFDM waterfall list and denote airports that have a	Industry	I	3Q2019

significant non-CDM flight operator presence (e.g., foreign flag carrier, non-CDM domestic carriers, general aviation) -			
CY2019-CY2021			
- Industry will collaborate with FAA during all remaining CSIT visits, that is, all industry-managed ramps will have the relevant industry member(s) participate and provide input as needed. This includes flight operators, airport operators, and third party ramp control providers, as appropriate. - Industry will participate and provide input during recurring SWIFT meetings, which are scheduled once a quarter, to ensure widespread community awareness of the available data and dependencies. All meeting presentations as well as meeting minutes will be made available to all industry participants following every SWIFT meeting, allowing awareness for all industry members present or not present. o SWIM TTP feed-connectivity to achieve TFDM surface metering benefits o SWIM TFCS feed-connectivity to accomplish departure substitutions during surface departure metering o Other decision support tools and NAS automation systems and the associated FAA data o SWIM and non-SWIM data exchange platforms	Industry	I	4Q2021

Appendix A – Membership

Data Comm NIWG Membership

Industry Co-chair: Chuck Stewart, United Airlines
Industry Co-chair: John O'Sullivan, Harris
FAA PMO SME: Jesse Wijntjes
FAA NextGen SME: Juan Narvid

Name	Organization
Daniel Allen	FedEx
Stacey Bechdolt	RAA
Scott Bender	FAA
Joseph Bertapelle	JetBlue Airways
Mike Boynton	American Airlines
Frank Buck	MITRE
Lou Casale	UPS
Andy Cebula	RTCA
Peter Challan	Harris
Perry Clausen	Southwest
Chris Collings	Harris
Jerome Condis	Airbus
Edward Evans	Southwest
Tams Frederic	FAA
Chad Geyer	NATCA
Steve Giles	MITRE
Jens Hennig	GAMA
David Heron	DoD
Fran Hill	Leidos
Tyler Juergens	Gulfstream
Gregg Kastman	UPS
Erik Levins	Hawaiian Airlines
John McCormick	FedEx
Rob Mead	Boeing

Name	Organization
Juan Narvid	FAA
Kieran O'Carroll	IATA
Andrew Onken	Rockwell Collins
Raymond Orie	FAA Contractor
John O'Sullivan	Harris
Mark Patterson	FAA
Jon Pendleton	Delta Air Lines
Darrell Pennington	ALPA
Bret Peyton	Alaska Airlines
Jasenka Rakas	UC Berkeley
Colin Rice	City of Houston
Anthony Rios	Avionica
Andrew Roy	ASRI
Brad Sims	SWAPA
Gus Skalkos	Sennheiser
Steve Smothers	Textron Aviation
Tom Staigle	Delta Air Lines
Wade Stanfield	Thales
Chuck Stewart	United Airlines
Kevin Swiatek	UPS
Brandi Teel	RTCA
Stephen Vantrees	FAA
Terry Walters	Alaska Airlines
Lee Weinstein	Leidos
Jesse Wijntjes	FAA

Appendix A – Membership *(continued)*

MRO NIWG Membership

Industry Co-chair: Glenn Morse, United Airlines
Industry Co-chair: Jon Tree, Boeing
FAA ATO SME: Harold Cooper, FAA
FAA NextGen SME: Paul Strande, FAA

Name	Organization
Glenn Morse	United Airlines, Co-Chair
Jon Tree	Boeing, Co-Chair
Bob Everson	Southwest Airlines
Dan Hanlon	Raytheon
Frank Alexander	Atlas Air
Jens Hennig	GAMA
John Bergener	SFO International
Mark Hopkins	Delta Air Lines
Marshall Koch	Mitre
Mike Cirillo	Airlines for America
Andy Marosvari	NATCA
Barbara Cogliandro	Metron Aviation
Todd OakWood	Embraer
Flavio Leo	MASSPORT
Chris Oswald	ACI
Darrell Pennington	ALPA
Paul Strande	FAA SME

Name	Organization
Harold Cooper	FAA SME
Phil Santos	FedEx
Jeff Tittsworth	FAA SME
Colin Rice	Houston Airport
Tim Stull	American Airlines
Lynae Craig	Alaska Airlines

Appendix A – Membership *(continued)*

PBN NIWG Membership

Industry Co-chair: Brian Townsend, American Airlines
Industry Co-chair: Steve Fulton, Independent Consultant
FAA PMO SME: Rob Hunt, FAA
FAA ATO SME: Donna Creasap, FAA
FAA AVS SME: Merrill "Jazz" Armstrong, FAA

Name	Organization
Merrill "Jazz" Armstrong	FAA SME
Frank Alexander	Atlas Air
Ric Babock	Allied Pilots Association
Michael Bailey	Northrup Grumman
Sean Barbee	PASS
Stacey Bechdolt	RAA
Bret Payton	Alaska Airlines
John Blair	FAA AVS
Trent Bigler	FAA AVS
Michael Cirillo	Airlines for America
Rick Boll	NBAA
Jonathon Bonds	UPS
John Brandt	MITRE
Brian Swain	Delta Air Lines
Rich Terry	Delta Air Lines
Todd Oakwood	Embraer
Rob Hunt	FAA SME
Donna Creasap	FAA SME
Brian Townsend	American Airlines, Co-Chair
Heidi Williams	NBAA
Jeff Woods	NATCA
Steve Fulton	Fulton Aviation, Co-Chair
Gregg Tennille	MITRE
Bennie Hutto	NATCA

Name	Organization
Darrell Pennington	ALPA
Joshua Kuntzman	DoD
Joseph Bertapelle	JetBlue
Scott Dehart	Southwest Airlines
Andrew Benich	American Airlines
Alexis Fecteau	Boeing
Larry Hills	FedEx
Lev Prichard	Allied Pilots Association
Mike McKee	FlyDenver
William Murphy	IATA
Glenn Morse	United
Ron Renk	United
Lynae Craig	Alaska Airlines
David Havrud	Boeing
Perry Clausen	Southwest Airlines
Marc Henegar	ALPA
Greg Young	Delta
George Hodgson	Southwest Airlines
Lee Brown	Landrum & Brown
Christian Cast	UPS
Rune Duke	AOPA
Gary McMullin	Southwest Airlines
Marshall Koch	MITRE
Phil Hargarten	NATCA

Appendix A – Membership *(continued)*

Surface and Data Sharing NIWG Membership

Industry Co-chair: Robert Goldman, Delta Air Lines
Industry Co-chair: Steve Vail, Mosaic
FAA PMO SME: Mike Huffman, FAA
FAA NextGen SME: Ben Marple, FAA
FAA System Operations SME: Dave Foyle, FAA

Name	Organization
Rob Goldman	Delta, Co-Chair
Steve Vail	Mosaic, Co-Chair
Joe Bertapelle	JetBlue
Jack Celie	DOD AF
Greg Berkebile	Saab Sensis
Rick Dalton	Southwest
Al Capps	NASA
Mike Cirillo	Airlines for America
Rick Boll	NBAA
Ben Marple	FAA, ANG
Josh Gustin	FAA, ATO
Chris Oswald	ACI
Dave Foyle	FAA SME
Dan Allen	FedEx
Bernie Davis	American Airlines
Charlie Mead	American Airlines
Tim Stull	American Airlines
Steve Link	HARRIS
Eric Van Drunt	Leidos
Flavio Leo	Massport
Curt Hedgepeth	McCarran Airport
Anthony Charles	McCarran Airport
William Leber	PASSUR
Dan London	SAAB Sensis
Stephen Burnham	SAIC
Dean Snell	NBAA

Name	Organization
Pete Slattery	NATCA
Shawn Engelland	NASA
Glenn Morse	United
Susan Pfingstler	United
Ralph Tamburro	PANYNJ
Lee Brown	Landrum & Brown

Appendix B: PBN: Initial Trajectory Based Operations Capabilities

Function Category	**Capabilities**
PBN	RNAV STAR Optimum Profile Descent (OPD) RNAV SIDs RNP / RNP with RF leg *Established on RNP (EoR)*
Strategic Planning / Flow Management	Airspace Flow Program (AFP), Ground Delay Program (GDP) *Collaborative Trajectory Options Program (CTOP)* *TM Coordination and Planning*
Route Management	Automated Reroutes Pre-Departure Rerouting Airborne Rerouting
Time-Based Scheduling (Airborne and Surface)	Arrival Metering Coupled Scheduling/Extended Metering Collaborative Air Traffic Management Departure Metering (scheduling) into Arrival Stream Departure Metering (scheduling) into En Route Stream *Terminal Metering* *Runway/Surface Balancing* *Surface Scheduling and Metering*
En Route and Terminal Spacing Tools	Converging/Crossing Runway Operation Spacing Indicators In-Trail Final Approach Spacing Indicators Delay Countdown Timer Speed Advisories *Path Stretch Advisories* *Slot Markers, Speed Advisories, and Sequence* *En Route Time of Arrival Control (TOAC)*
Surface Management	Tower Data Communications for Pre-Departure Clearance *Electronic Flight Data* *Airport Configuration Management*
Enterprise Enablers	Information and Data Exchange *Air-Ground Data Communication* *Enhanced Weather Data, Reporting, and Integrated Products*

Source: "Initial Trajectory Based Operations Overview" briefing from FAA on August 16, 2018

Key:
Currently available capabilities are in normal font
Planned capabilities are in italic font