NAC Meeting

June 12, 2023

Opening of Meeting

Chip Childs, NAC Chair

President & CEO (SkyWest Airlines)

Opening Remarks

Polly Trottenberg, Acting FAA Administrator

Public Meeting Announcement

NextGen Advisory Committee (NAC)

June 12, 2023

Public Statements

Members of the Public

NAC Chair Report

Chip Childs, NAC Chair

President & CEO (SkyWest Airlines)

Motion for NAC Approval

- February 28, 2023 – NAC Meeting Summary Package Draft

FAA Report

Katie Thomson, Delegated NAC Designated Federal Officer (FAA)

FAA Report

Tim Arel, Chief Operating officer, Air Traffic Organization (FAA)

FAA Report

Jodi Baker, Deputy Associate Administrator, Aviation Safety (FAA)

Chair's Roundtable Discussion: NextGen In Denver

Chip Childs, NAC Chair

President & CEO (SkyWest Airlines)

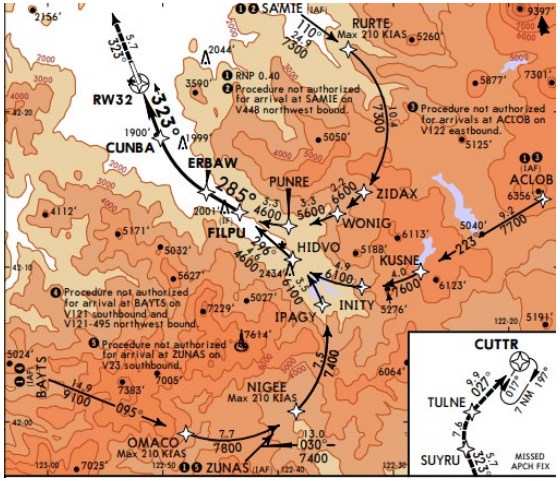
NextGen at DEN….
What's the Big Deal?

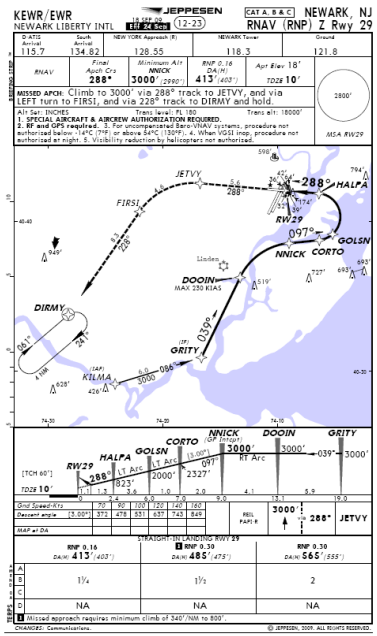
Ron Renk

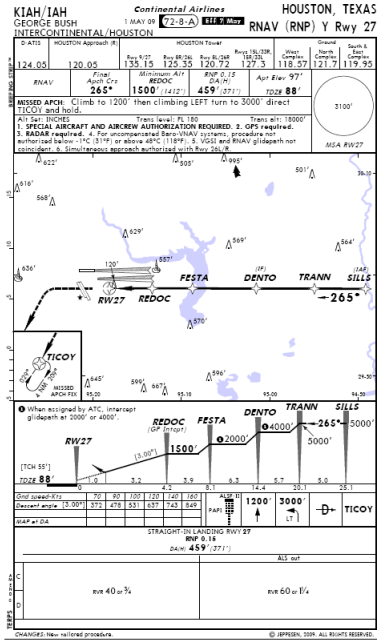
5/22/2023

How Did We Get to EoR at DEN?

- **Four fundamental cases where we see benefits for Spaced Based approaches today:**
  1. Efficiency and Carbon Reduction = DEN, IAH, LAX
  2. Terrain constrained airports. Example = MED, EGE
  3. Airspace constrained airports. Example = EWR, DCA
  4. Self-contained approach, Redundancy for busy hub operations. Example = All Hubs, PTKK, PTPN



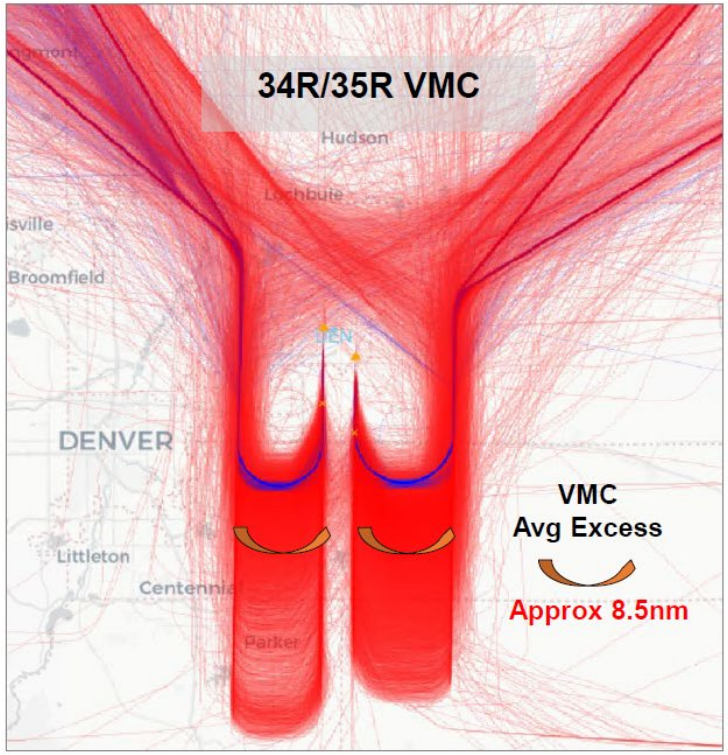


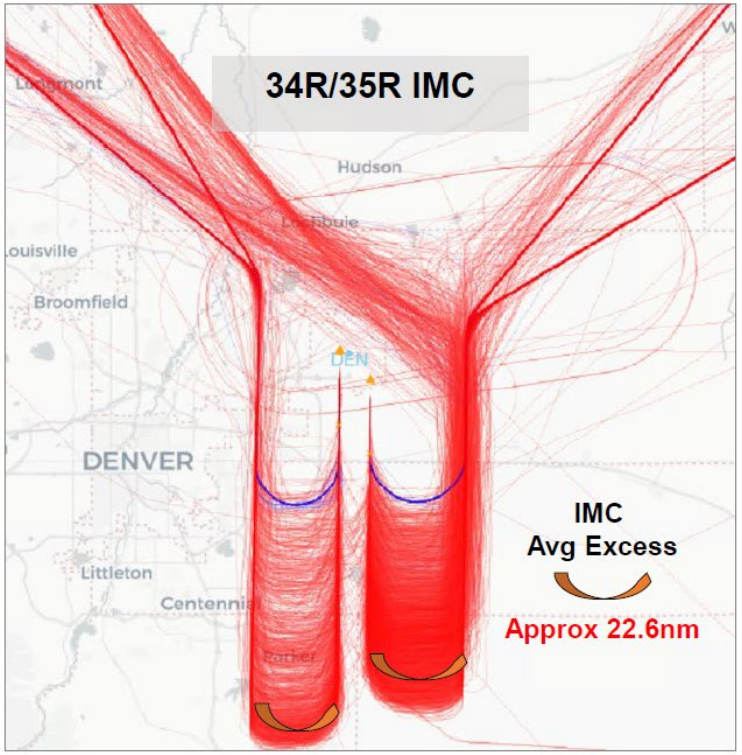


UNITED

Honorable Mentions for EoR

- Hub improvements – Schedule reliability, fuel efficiency, carbon reduction, and throughput:





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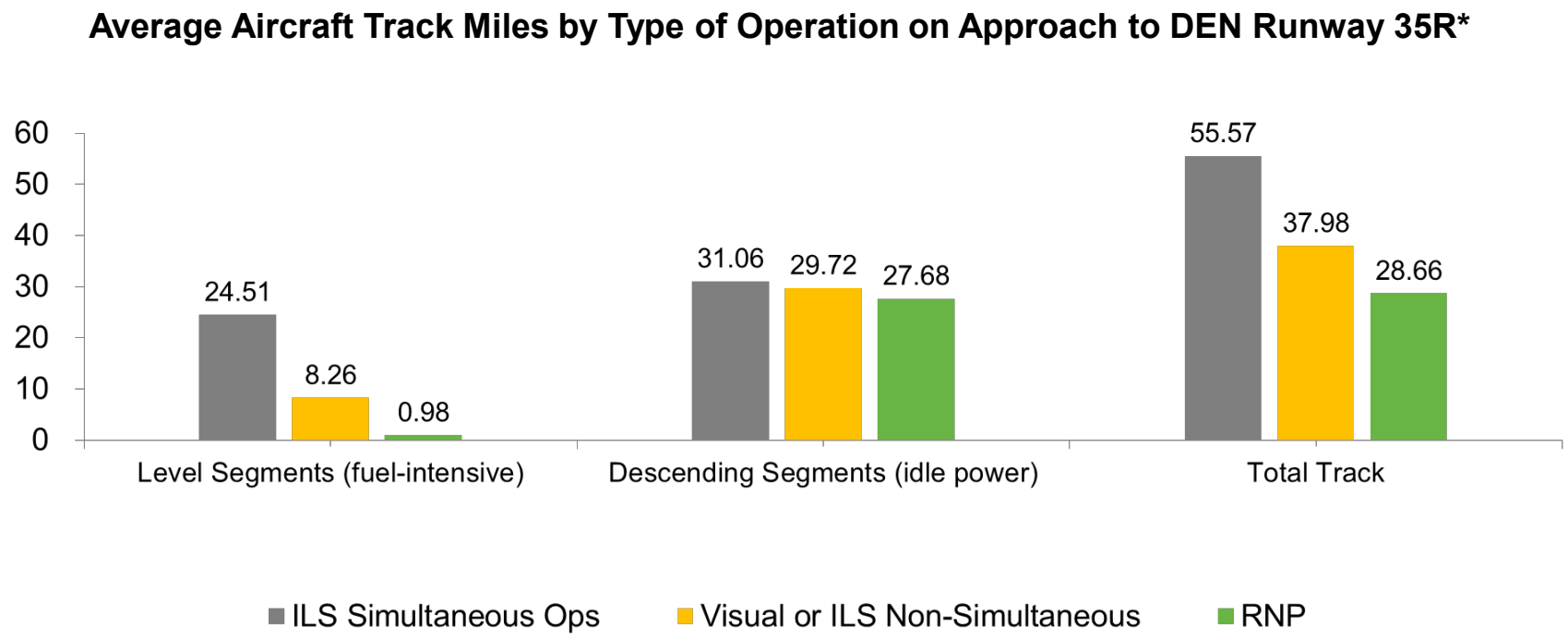

Honorable Mentions for EoR

- Hub improvements – Schedule reliability, fuel efficiency, carbon reduction, and throughput:

RWY35R Downwinds OCT 2021

RWY35R Approach Direction	RWY35R Approach Assigned	WX Below 5000 CIG 5NM VIS	WX Above 5000 CIG 5NM VIS	RWY35R Total Flights	All Flight		Level Flight	
					Avg Miles Flown	Std Dev of Miles Flown	Avg Miles Flown	Std Dev of Miles Flown
Downwind	**RNP**	**7**	**540**	**547**	**13.24**	**0.11**	**1.46**	**1.97**
	Visual	76	1156	1232	20.14	4.98	8.01	5.57
	ILS 5-9-7 SIMOS	58	65	123	38.43	5.24	25.90	7.62

Carrier	Proportion RNP Equipped	# Downwind Flights with RNP Equipage	# Downwind Flights that Flew RNP Turn	RNP Success Rate for Downwind Flights			
				Overall	High	Medium	Low
100% Equipped	100%	31,066	14,625	47.1%	16.9%	47.6%	72.3%
Non-100% Equipped	54.8%	27,904	7,580	27.2%	10.4%	31.0%	47.5%

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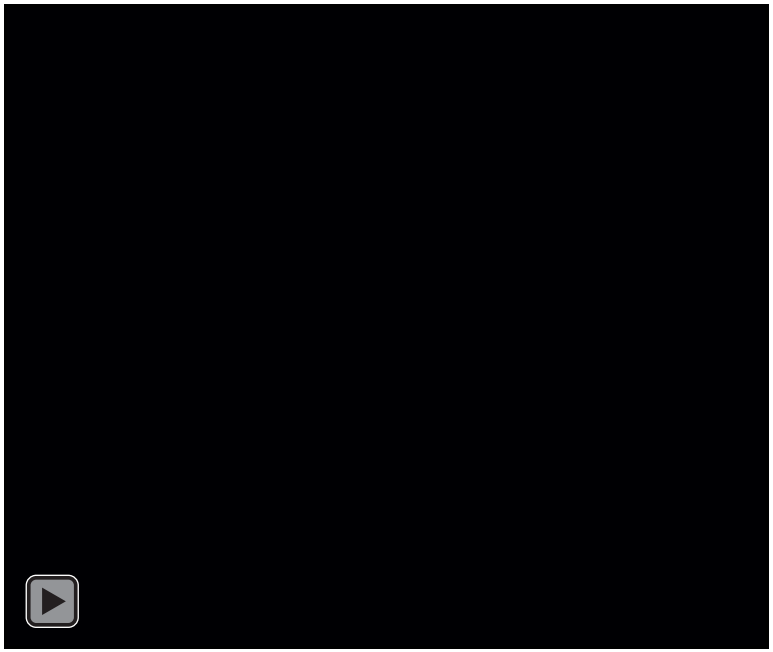
Honorable Mentions for EoR

- **Left Video** – Ability to take advantage of unused slots in IMC at DEN
- **Right Video** – More Equipage means more EoR



Lessons Learned and Application

- **More Pilot training and use needed to get proficient**
  - Pilots properly close discontinuities
  - Stay on downwind in worst case scenario
  - Use of route 2 or secondary flight plan

- **Better Controller understanding of pilot/aircraft limitations on RNP approaches**
  - No last minute requests for RNP
  - Vectors instead of re-joining STAR when pulled off STAR

Pilots and EoR

"I'm glad you two have finally met."

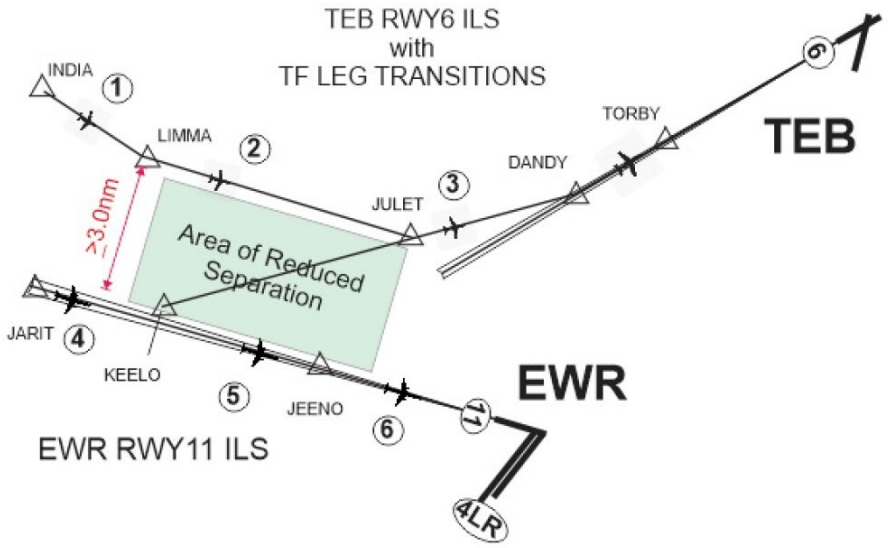
What's Next With RNP AR?

- **Temperature Compensation in FMC/FMGC to improve consistent vertical path**

- **Need More controller tools and automation**
  - Terminal Sequencing and Spacing (TSAS)
  - Trajectory Based Operations (TBO)

- **New EoR rules for less than widely spaced**

- **Multiple Airport Route System (MARS)**



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TBFM Main Capability Use at Denver Center (ZDV)

- Single Center Metering (SCM) at Denver Center – manages metering internal to ZDV
- Adjacent Center Metering (ACM) – extension of SCM to ZLA
- Constraint Satisfaction Point (CSP) – a meter arc or fix or other meter reference element
- Coupled Scheduling (CS)/Extended Metering (XM) – adds additional CSPs for an aircraft to meet the scheduled time of arrival along their routes, This results in a more optimal distribution of delays over a greater distance from the airport or the CSP
- En Route Departure Capability (EDC) – scheduling capability that assists in formulating release times to a miles in trail restriction
- Departure Scheduling – obtains a release from TBFM to schedule into an arrival flow
- Integrated Departure/Arrival Capability (IDAC) – Capability allows the ATCTs to conduct departure scheduling electronically (on the waterfall)

This is a Team Effort!!

UNITED

DEN NextGen Highlights

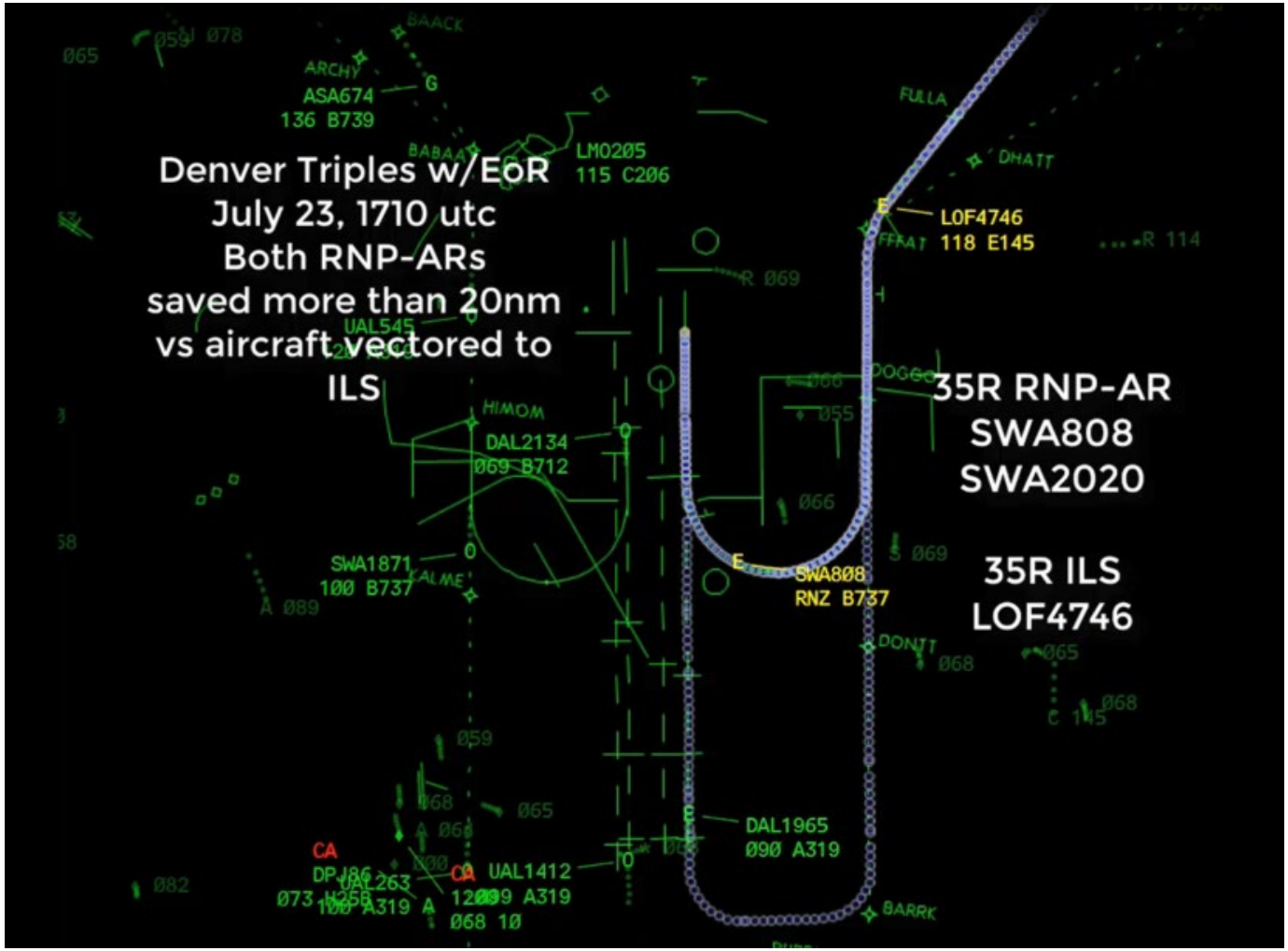
June 12, 2023 NAC Meeting

Southwest Airlines Air Traffic Management and Flight Operations Technical

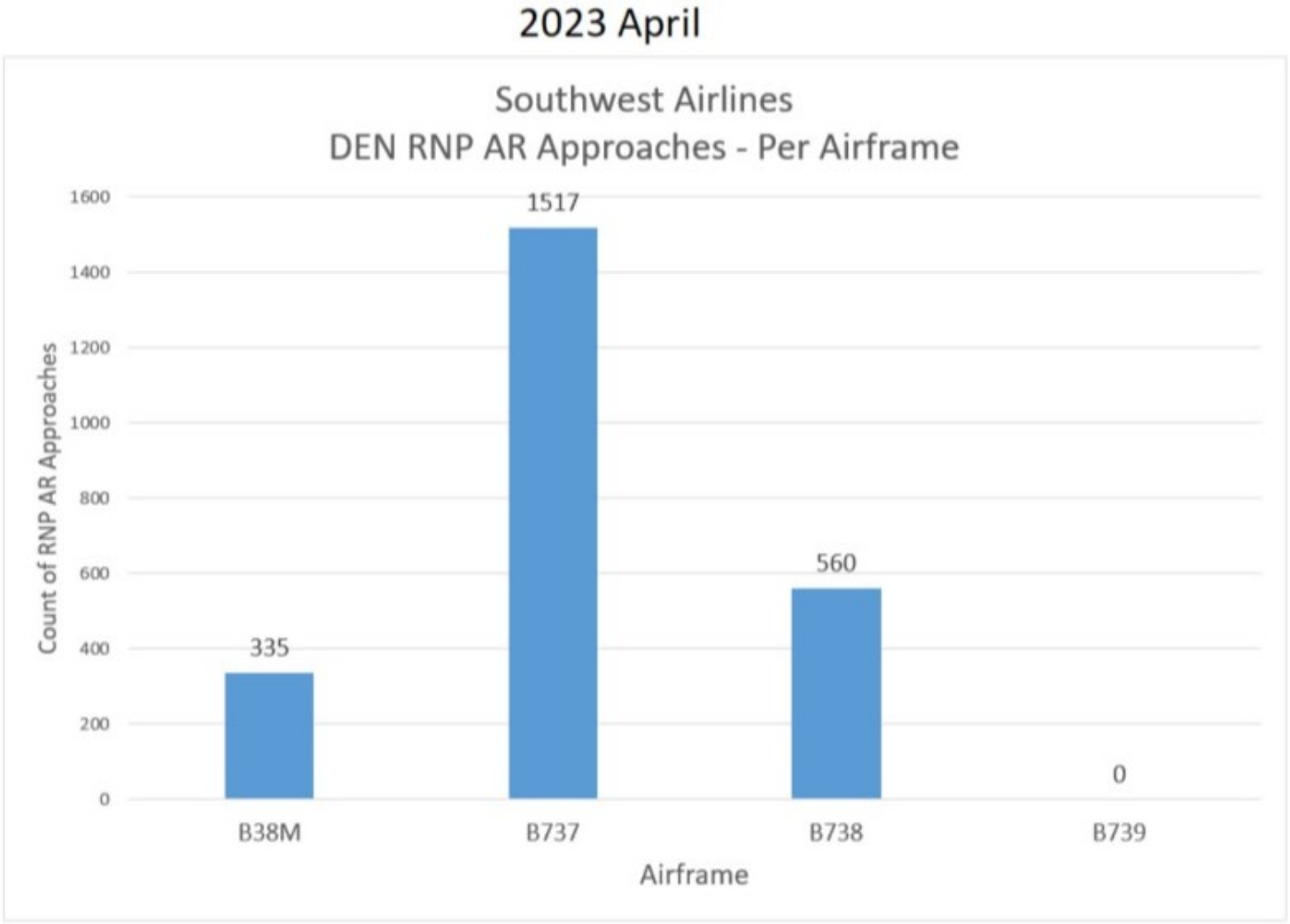
The NextGen story unfolding at DEN…

- ❑ RNP Utilization
- ❑ DataComm DCL
- ❑ Time-Based Flow Management (TBFM)

Key Development for RNP initiative – DEN laid the national foundation for EoR

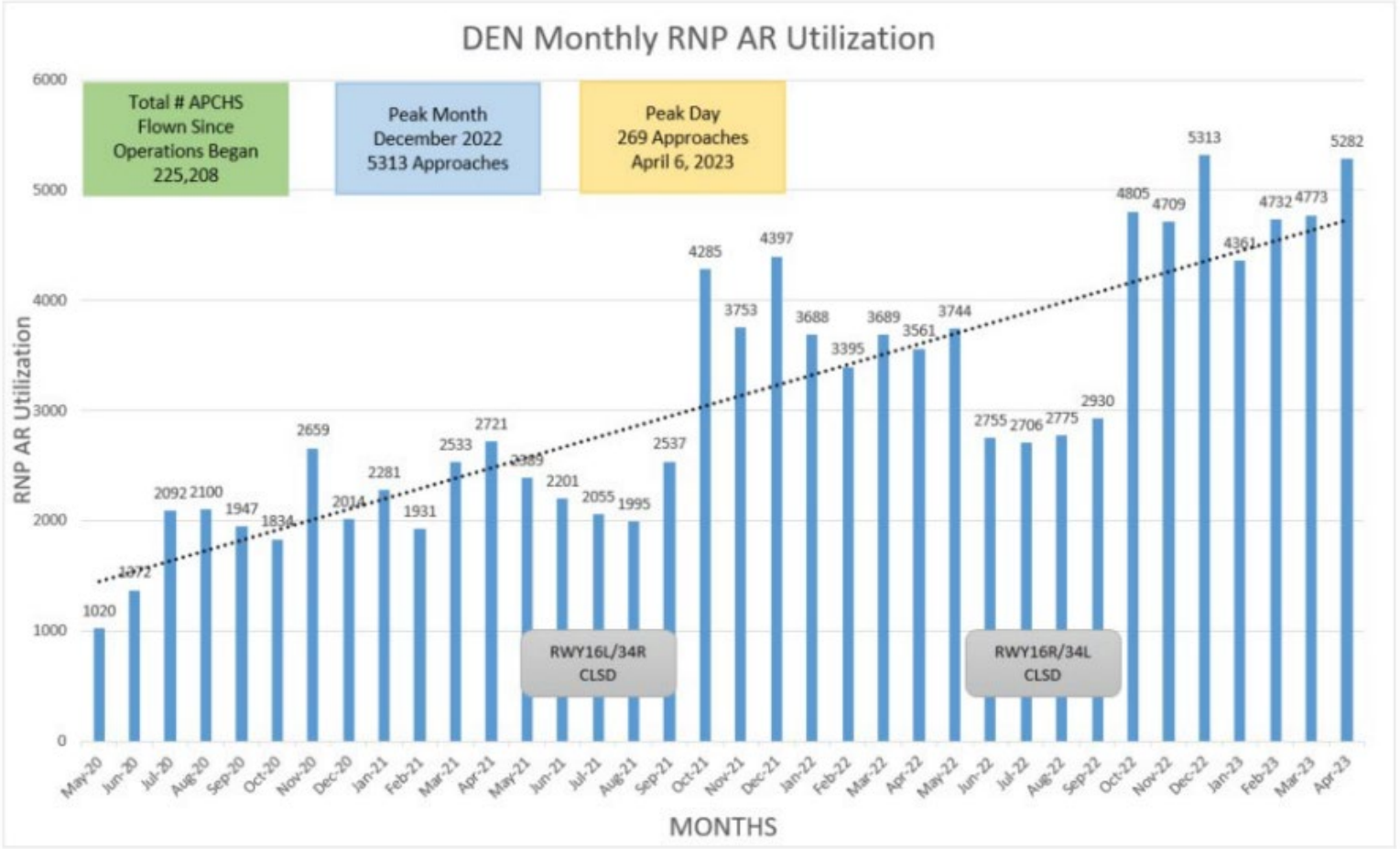


RNP Advancement – New rules and innovative minds at D01 bringing greater efficiencies



Encouraging trends….

DEN Count – April 2023



RNP Utilization – can you say sustainability?

RNP Benefits and Utilization April 2021 to March 2023 – how might we drive these numbers up without TSAS?

DEN

Level		
KDEN	RNP Av Time from 40 nm out to TD (m)	13.8
	non RNP Av Time from 40 nm out to TD (m)	13.0
	Average Time Savings/Loss (m)	1.1
	Total Time Savings/Loss (m)	25,604.2
	RNP Avg GTD from 40 nm out to TD (nm)	59.9
	non RNP Avg GTD from 40 nm out to TD (nm)	54.6
	Average GTD Savings/Loss (nm)	4.1
	Total GTD Savings/Loss (nm)	98,968.3
	RNP Avg Fuel from 40nm out to TD (lbs)	542.5
	non RNP Avg Fuel from 40nm out to TD (lbs)	547.7
	Average Fuel Savings/Loss (lbs)	83.0
	Total Fuel Savings/Loss (lbs)	1,984,396.5
	% RNP	16.2%
	RNP Flight Count	23,910
	non RNP Flight Count	123,369

DEN CPDLC DCL Benefits for SWA

February 2022 to February 2023

Cleared 86,823 flights

Saved 22,234 minutes of airspace user time (gate and taxi)

Prevented 926,717 kgs of CO_2 Emissions

In February 2023

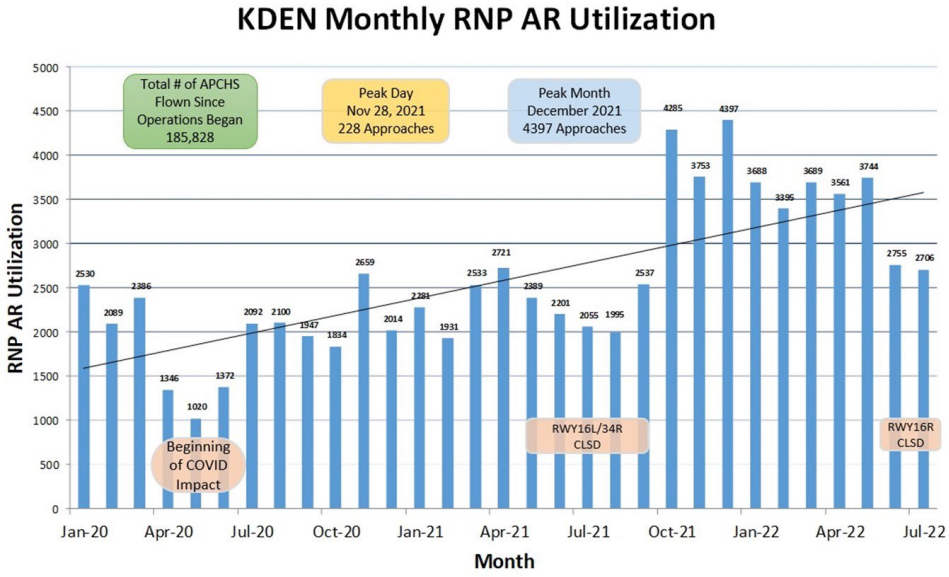
Cleared 6,298 flights

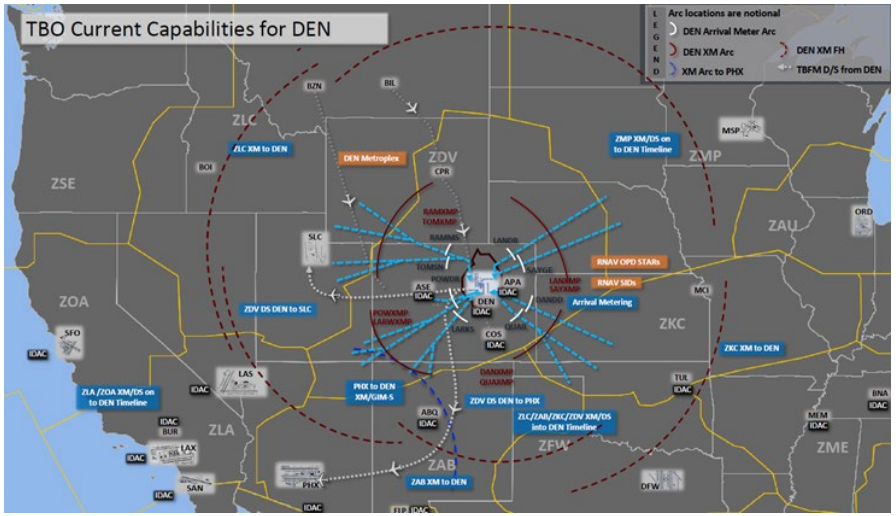
Saved 516 minutes of airspace user time (gate and taxi)

Prevented 18,224 kgs of CO_2 Emissions

Time-Based Flow Management (TBFM) - A prerequisite to TBO functioning daily at DEN

- More consistent use of metering in ZDV since Oct 2021 deployment.
- XM allows greater flexibility and is attributed to increased use of RNP approaches (from 2500/month to 3500/month)



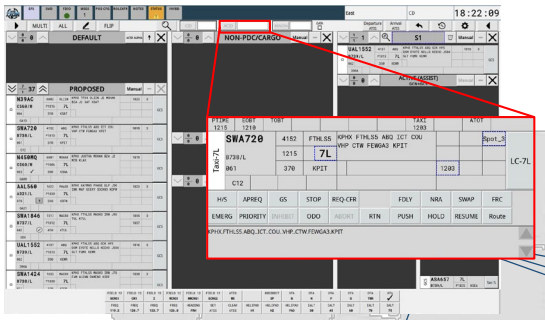


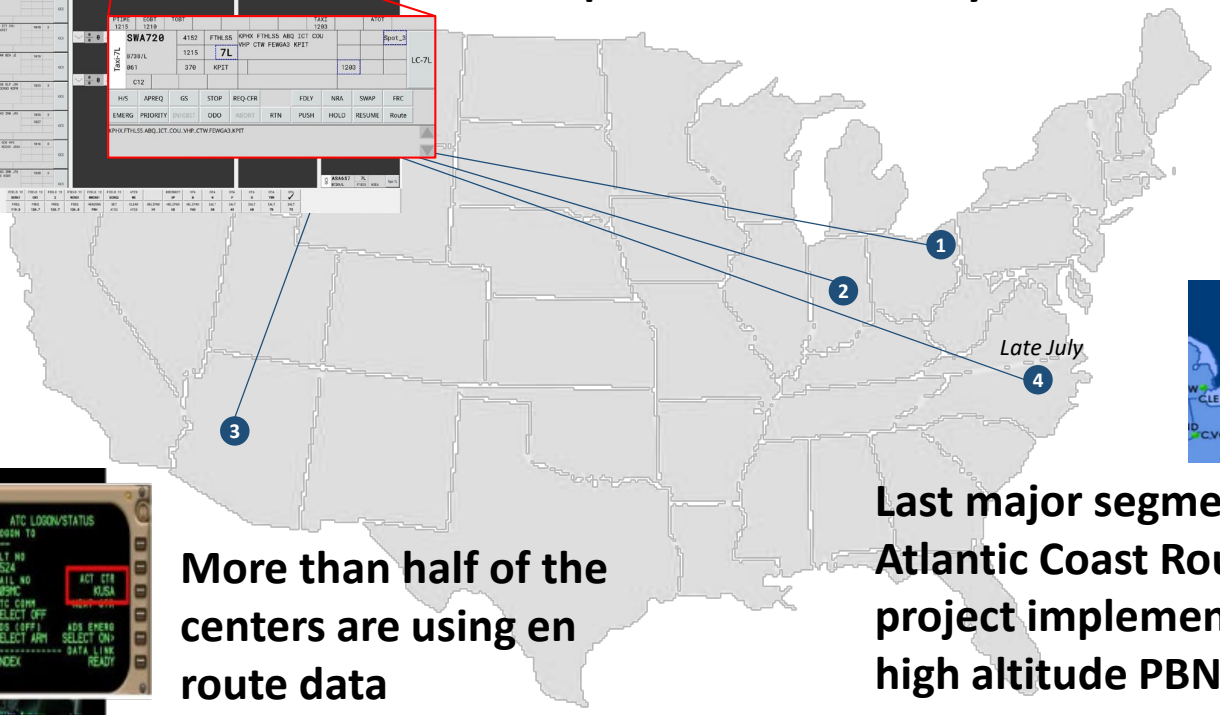
NAC Subcommittee Chair's Overview

Warren Christie, NAC SC Chair (JetBlue Airways)

Overview of Implementation Milestones (since February 2023 NAC)

Electronic Flight Strips (EFS) are operational at three airports, with a fourth planned for late July





More than half of the centers are using en route data communications

Last major segment of the Atlantic Coast Routes project implemented new high altitude PBN routes

Workgroup Presentations

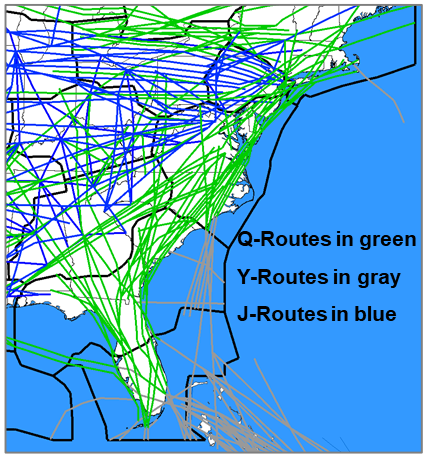
- **Northeast Corridor:**
  - Ralph Tamburro (PANYNJ) & Lee Brown (JetBlue Airways)
  - Aaron Wilkins (FAA), Juan Narvid (FAA), & Raul Zamora Jr. (FAA)

- **Performance Based Navigation:**
  - Eric Morse (Delta Air Lines)
  - Aaron Wilkins (FAA), Juan Narvid (FAA), & Raul Zamora Jr. (FAA)

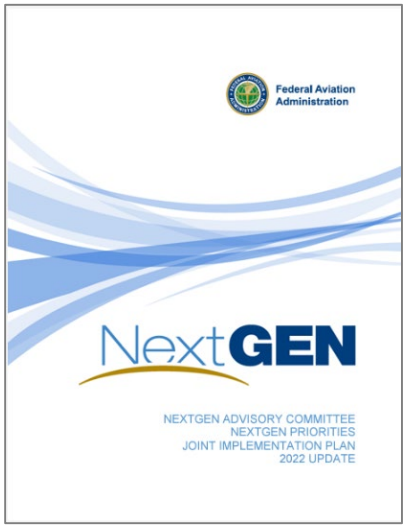
- **Surface and Data Sharing:**
  - Rob Goldman (Delta Air Lines) & Chris Oswald (ACI-NA)
  - Doug Swol (FAA) & Ayaz Kagzi (FAA)

- **Data Communications:**
  - Chris Collings (L3Harris) & Ed Evans (Southwest Airlines)
  - Kathy Torrence (FAA)

Northeast Corridor/Performance Based Navigation – Status



Actively using high-altitude routes implemented as part of the Atlantic Coast Routes (ACR) effort in late April



No changes to the remaining implementation commitments (since February NAC)

Airspace move in New York is currently on hold; impact to current commitments is unknown

All Industry commitments are complete or on schedule

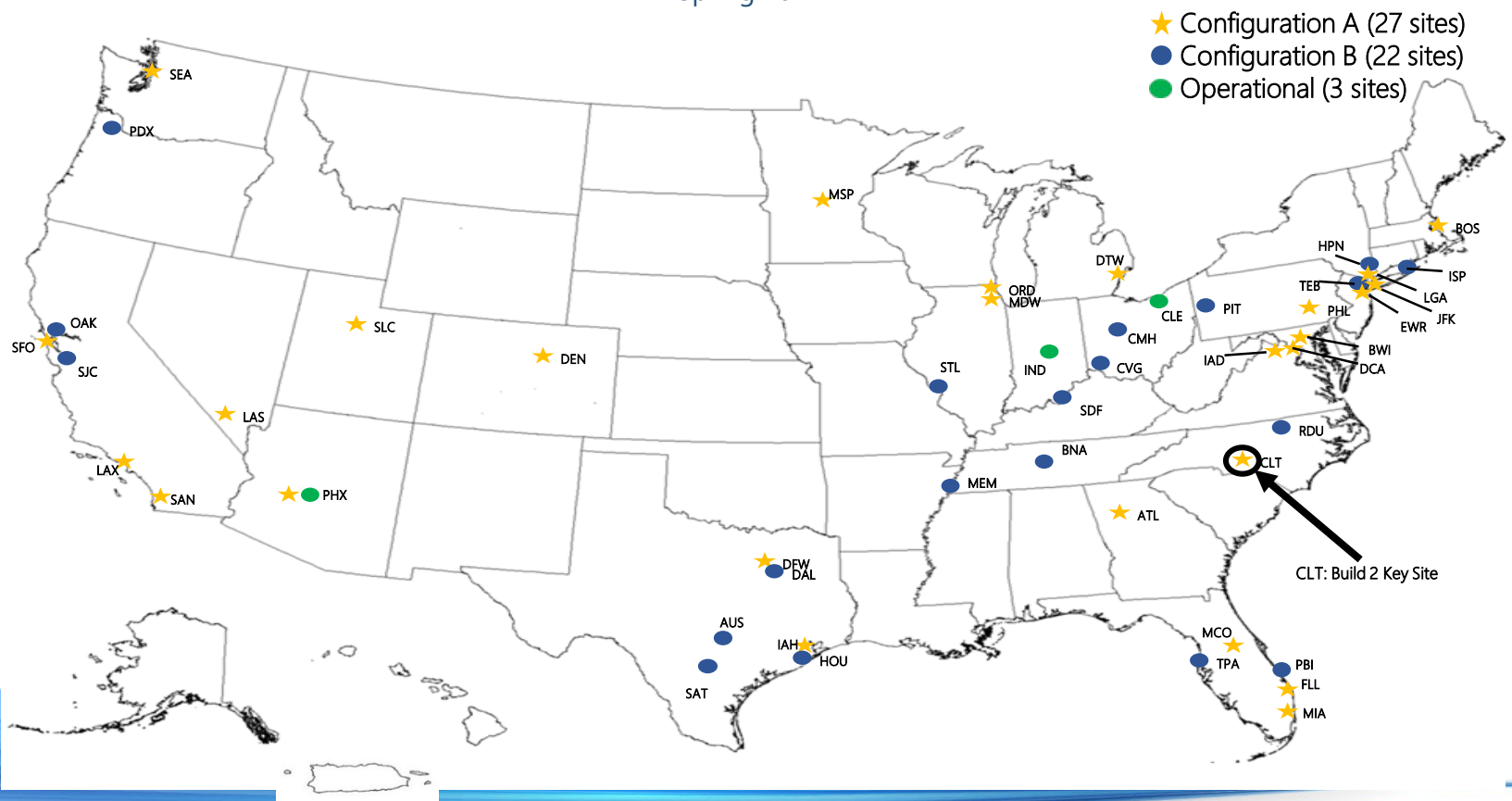
Surface & Data Sharing – NAC Update

Key TFDM Updates

- Indianapolis (IND) achieved IOC on Build 1 (Electronic Flight Data) on 5/15
  - First site to directly transfer from paper flight strips to electronic flight and TMI data
- Phoenix (PHX) achieved IOC on Build 1 on 6/5

Near Term Activities

- TFDM 4th IOC at Raleigh-Durham (week of July 24th)
  - Completes another NAC milestone
- Updated TFDM waterfall planned for release in late June based on FY25 budget guidance
- Las Vegas Collaborative Site Implementation Team (CSIT) week of June 12th
- TFDM Build 2 (Surface Management Tools) on track for IOC in Spring 2024



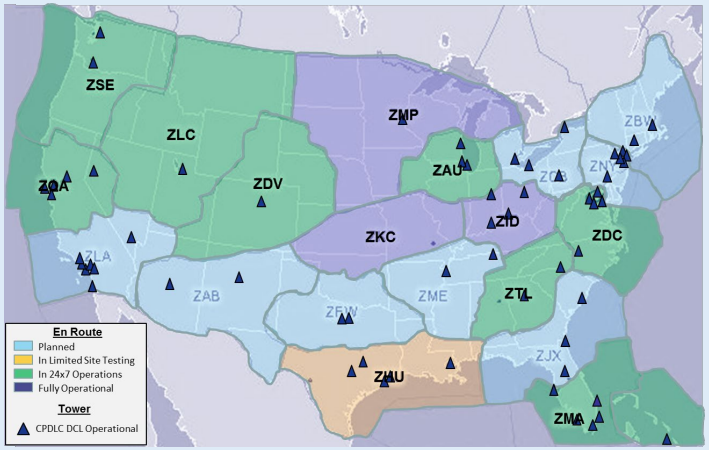
Surface NIWG – Plans for Summer/Fall 2023

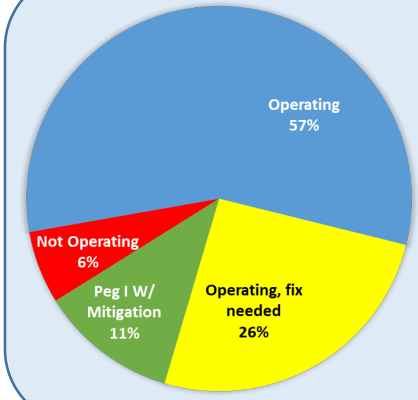
- Provide industry input and guidance regarding TFDM implementation
- Assist with Collaborative Site Implementation Team (CSIT) efforts when helpful.
- Seeking to engage members in discussion of how industry (flight operators, airport operators) can enhance surface operation safety and efficiency.
  - Technology
  - Process changes
  - Use of surface data
- Turn attention to what's next in collaborative flow management
  - surface management is an integrated component of flow management tools and processes
  - utilize data exchange to manage NAS capacity/demand
  - support efficiency, throughput and sustainability

Data Comm – NAC Update

En Route Data Comm Deployment

+ 11 centers operational 24/7
+ Houston Center began testing May 10
+ En Route Full Services Increment 1 active at all active centers
– En Route deployment delayed due to funding constraints

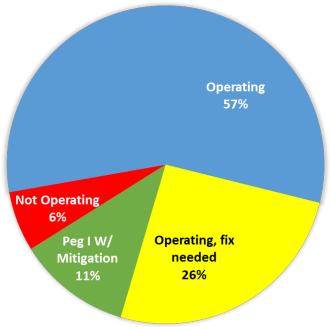




Industry & Avionics Performance Updates

+ Installation of avionics updates over halfway complete
+ Continue to receive positive user feedback as usage grows
– Awaiting Data Comm avionics updates blocking fleet participation with no confirmed plan (A220)
– NIWG members expressed concern about the “Enhanced Services” baseline slipping to end of 2029

Data Comm Avionics Updates Fleet Status



Aircraft operating in Data Comm En Route – No Pending Actions (57%)	
Alaska Airlines: B737	**JetBlue:** A321LR
American Airlines: B737, B777, B787	**Southwest Airlines:** B737
Delta: A330neo	**United:** B777, B787
FedEx: B777, MD11	**UPS:** B744, MD11, B748

Avionics Action	Operator/Fleet	Status
Aircraft operating in Data Comm En Route with Crew Procedure Mitigation (11%)		
Boeing 757/767 Pegasus 1	FedEx, UPS	Aircraft operating under procedure mitigation; Avionics Update: Peg 1 BP11 (Q3 2023)
Aircraft operating in Data Comm En Route with Open Avionics Actions (26%)		
Collins CMU 900 Core 16	American, Delta, United	Delta & United began installs; American nearing completion
Boeing 767 ATN 505+ (Core 16)	FedEx	Newly delivered B767s starting in mid-2022 do not have “Core 16” equivalent avionics. Update planned Q2 2023.
Boeing 747-8 ATN-203 (Core 16)	UPS	“Core 16” equivalent. Installs ongoing.
Airbus A320 ATSU CSB 7.5	Alaska (100%), American (100%), Delta (17%), JetBlue (99%)	CSB 7.5 released in late 2020, technical issues increased, root caused; Fix planned for CSB 7.6 Q4 2024 (or CSB 9 available now)
Airbus A320 ATSU CSB 7.6	Alaska, American, Delta, JetBlue	CSB 7.6 planned for Q4 2024 (or CSB 9 available now)
Aircraft removed from Data Comm En Route due to Open Avionics Actions (6%)		
Collins VDR Update	United	Install delayed
Boeing 757/767 Pegasus 1	United	Pending Peg 1 BP11: Q2 2023
Airbus A220	Delta, JetBlue	Pending avionics fixes, FMS update Q4 2023; **RIU update TBD**
Airbus A350	Delta	Pending avionics fix, installs to begin soon

Operating, no action required | Operating fix needed | Peg 1 operating with mitigation | Not operating

NAC Task 23-1: NAS Airspace Efficiencies

Lee Brown (JetBlue Airways) & **Ron Renk** (United Airlines)

Shawn Kozica (FAA)

NAC Task 23-1: NAS Airspace Efficiencies

The FAA requests NAC advice on ways to achieve greater airspace efficiencies as we collaboratively attempt to reduce reliance on and divest from legacy systems and procedures and move to a reliance on a more modernized NAS.

The FAA offers the following suggestions as a way to begin the efficiency discussions:

1. Within the scope of current FAA automation capabilities, explore opportunities for increased utilization of existing Performance Based Navigation (PBN) procedures.
2. Identify opportunities for industry to leverage efficiencies gained from their avionics and dispatch systems investments while simultaneously allowing the FAA to divest from legacy NAS elements that do not contribute to those efficiencies.
3. Identify opportunities for the FAA to remove existing and infrequently used Instrument Flight Procedures (IFPs).
4. Identify opportunities to potentially modify existing IFPs/Standard Instrument Departure Procedures (SIDs)/Standard Terminal Arrival Procedures (STARs) to gain overall airspace efficiencies.
5. Identify a recommended baseline PBN and non-PBN IFP infrastructure to provide the minimum service level and airport access for both non-Global Positioning System/Area Navigation equipped aircraft and aircraft with advanced avionics for each Navigation Services Group Airport Category (1-5).
6. Identify any trends in IFP/SID/STAR inventory suggestions that might be used as a national standard.
7. Explore opportunities for even greater efficiencies with the use of Advanced Required Navigation Performance (A-RNP) as is being pursued by the Performance Based Operations Aviation Rulemaking Committee.
8. Work with the NAC Subcommittee Minimum Capabilities List (MCL) Team to capitalize on any cross-cutting issues that might support both taskings and industry achieving MCL-level of equipage.

Value of this Tasking

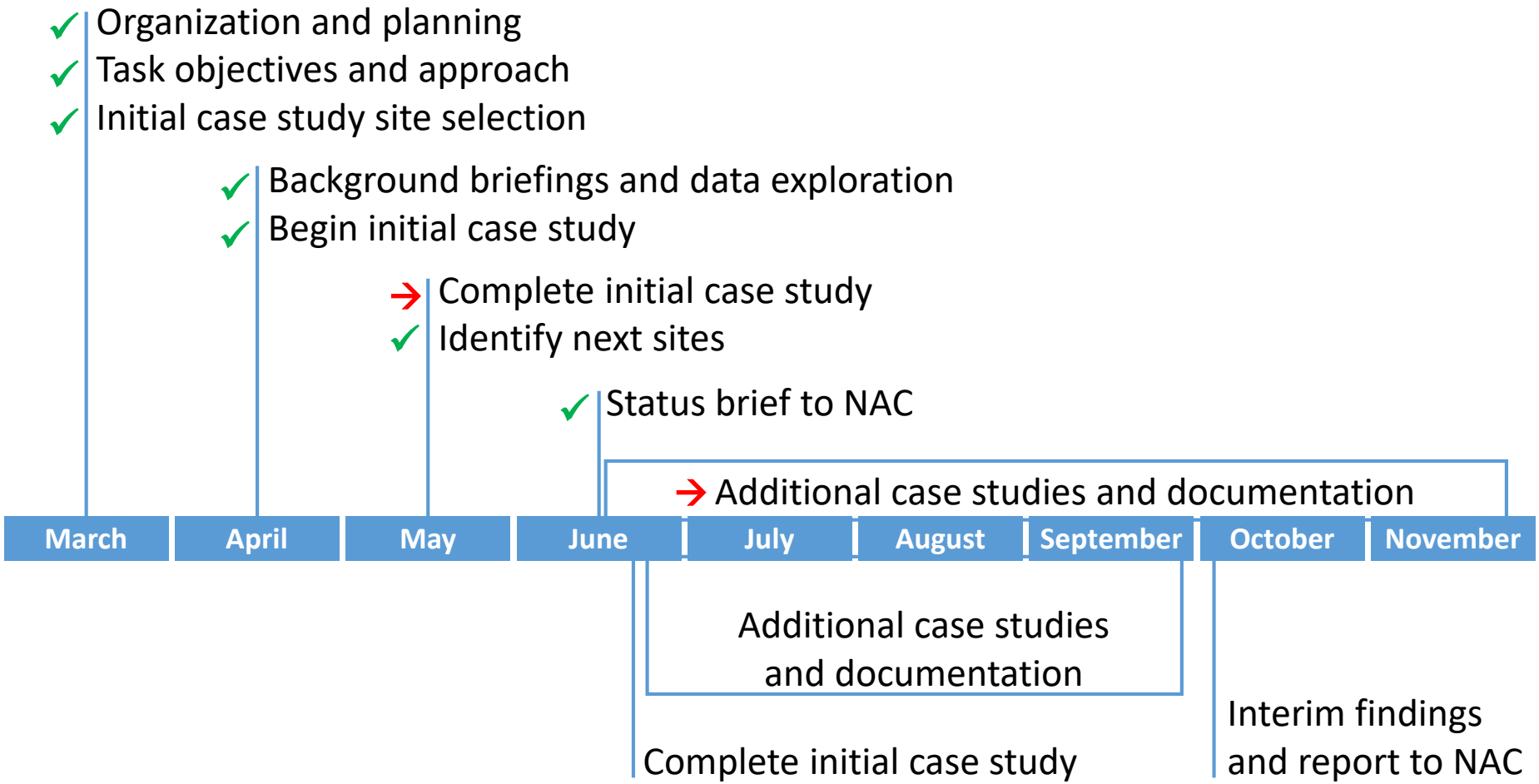
Presents the potential to inform…

- Long-term planning and priorities
- National standards that will help achieve the principals of the NAS Navigation Strategy
- How we do business going forward -where we invest and how we resource

Managing procedure inventory is important, but this tasking is not limited to that

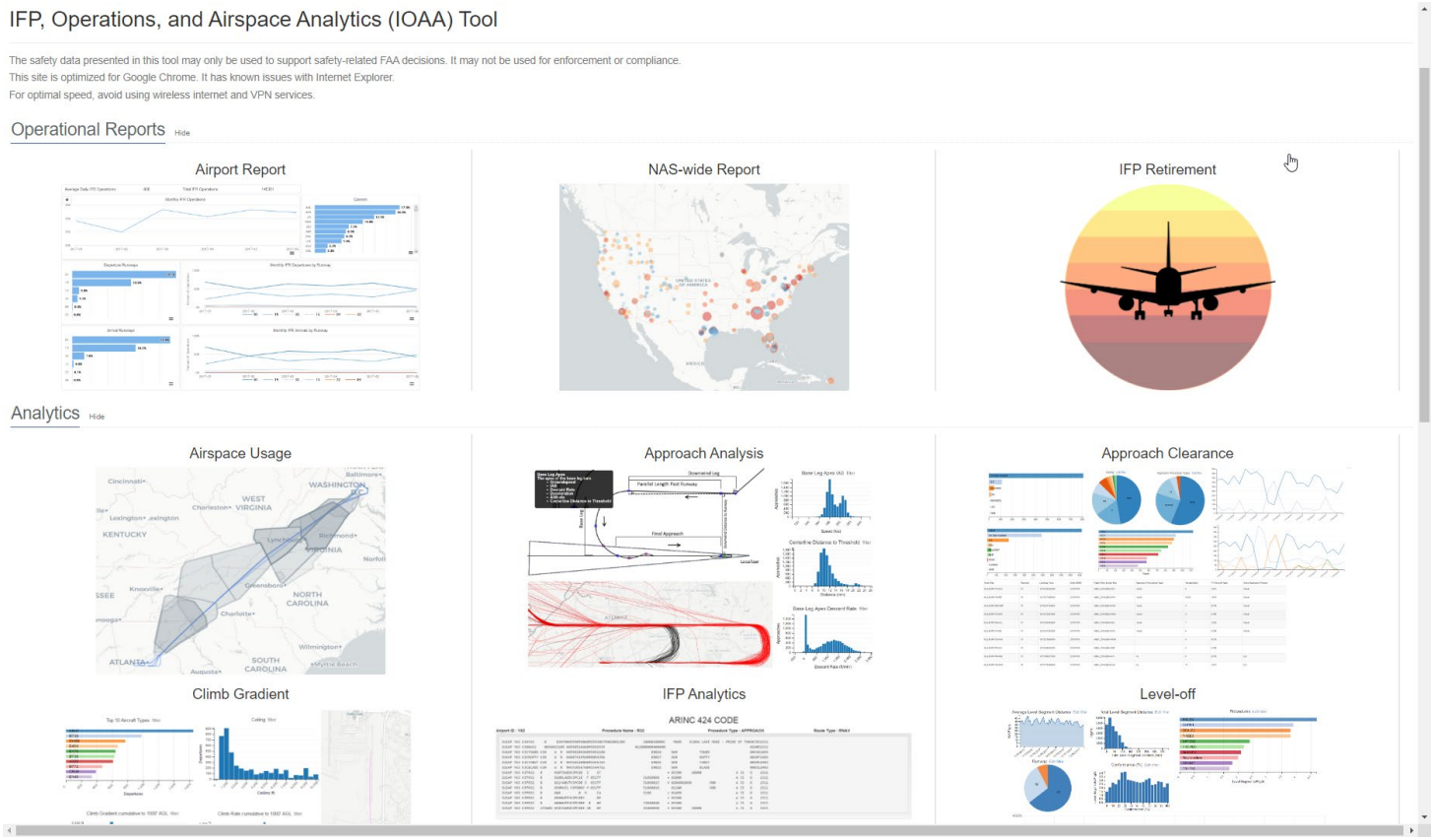
- There have been previous efforts to reduce the instrument flight procedure inventory which should support this task

Task Schedule and Progress Overview



Work Group Activities - Supporting Data

Use of IFP Operations, and Airspace Analytics (IOAA) Tool for database driven decisions



Working Group Activities – Data Driven Process

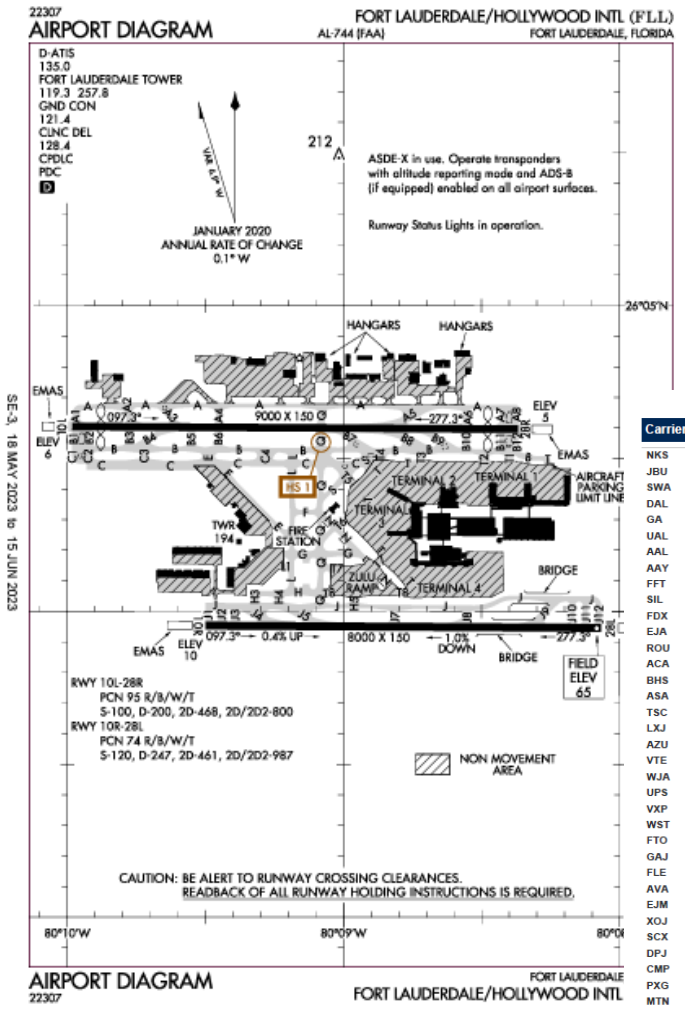
- **Since the last NAC, the group has started to define a process that can look at both objective and subjective facts**

- **Process includes:**
  - Notional minimum service levels based on airport NSG category
  - Comprehensive list of other considerations that need to be given if IFPs are to be removed

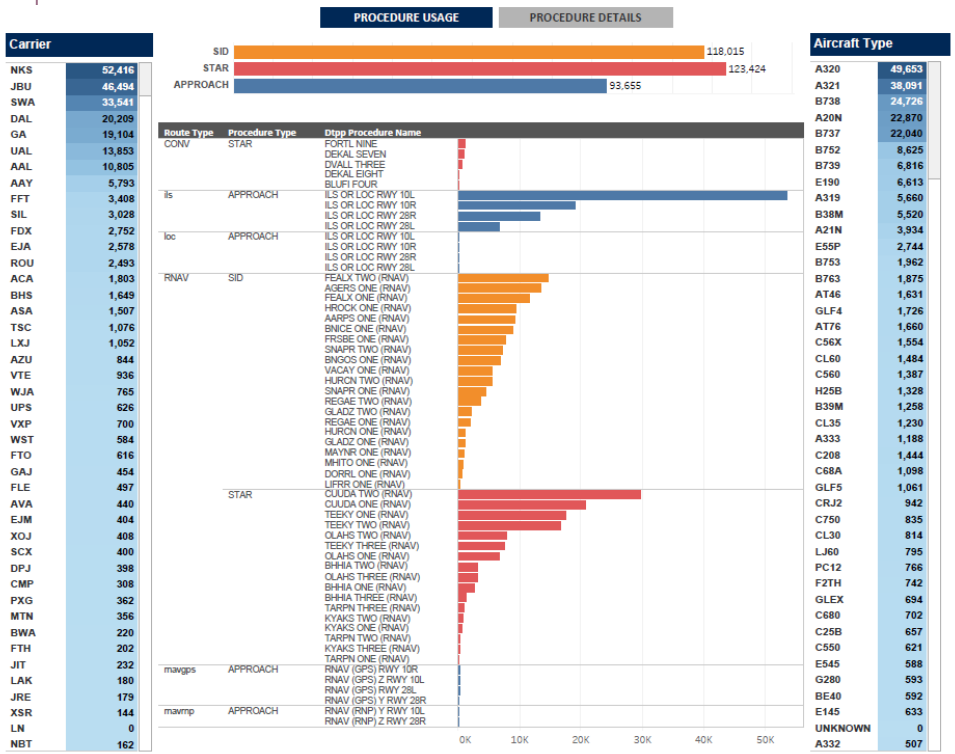
Process Worksheet Overview

Airspace Constraints	Airport Planned Changes (New runways, Construction, Closed areas)
Runway Configuration/Airport Layout	Types of Operations (flight training/air ambulance/etc.)
Common Weather Patterns (Foggy, low vis, etc.)	Operation Peaking/Limitations Due to Throughput
Airport Lighting Consideration	Military Presence (type of operations, fleet mix, etc)
Terrain Contraints/Obstacle Constraints	Procedure Constraints (arrival to approach connections)
Noise Constraints/Airfield/Flight Procedure Environmental Review Currently Underway	Special Events held at/near airport
Operational Trial Activities/Potential Activities	Contingency Procedures (ATC assigned only)
Controller Tools Available	User Requested Approaches
Fleet Mix (aircraft types/fixed wing/ helo/etc.)	ATC Resources
Operator Mix	Redundant Procedures (direction/equipage/etc.)
Equipage Levels	Procedures that are designed but don't work in the airspace

Initial Case Study – Fort Lauderdale



- Fort Lauderdale selected as first site for case study
- FAA provided data on fleet mix, procedure usage, etc.
- Initial review of procedures completed



Next Steps

- **Additional case studies that will tease out additional items from the tasking**

	DEN	LAX	DFW, DAL, ADW	LGA, JFK, EWR, TEB, HPN	BNA
NSG 1?	X		X	X	
Lots of procedures?	X	X	X		
Redundant procedures?	X		X	X	
Limited PBN?				X	
Under- or well-utilized?	X	X			X
More than one airport?			X	X	

- **Scoping work over the summer**
  - May include working case studies in parallel
- **Targeting initial findings for report to NAC in October**
  - Include conclusions from completed case studies
  - Identify additional deliberations to address full scope of the tasking

FAA Topics

Katie Thomson, Delegated NAC Designated Federal Officer (FAA)

Section 547 Update

Juan Narvid (FAA) & Kathy Torrence (FAA)

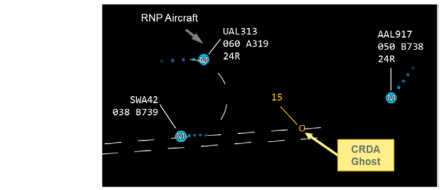
Section 547 Pilot Program:
Preliminary Analysis Results

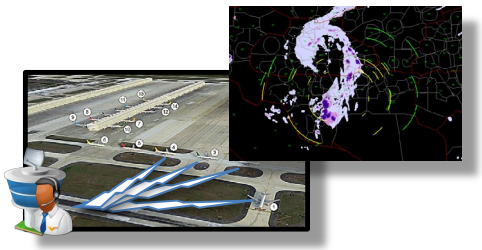
June 2023

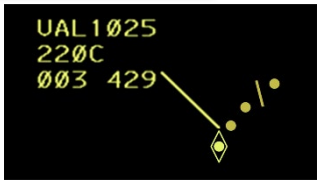
Overview of Selected Section 547 Initiatives

Process: Industry provided FAA a 'short list' of candidate recommendations based on Readiness, Return, & Relevance

Initiative
Simultaneous Independent Established on RNP (EoR) at Los Angeles International Airport (LAX) *(start date: September 12, 2021)*
CPDLC Departure Clearance (DCL) capabilities at Orlando International Airport (MCO) *(Focused metric tracking September 1, 2021)*
Automatic Dependent Surveillance-Broadcast (ADS-B) Out enabling 3 nautical mile (NM) in en route airspace (below FL230) for Oakland Air Route Traffic Control Center (ZOA) *(start date: September 9, 2021)*





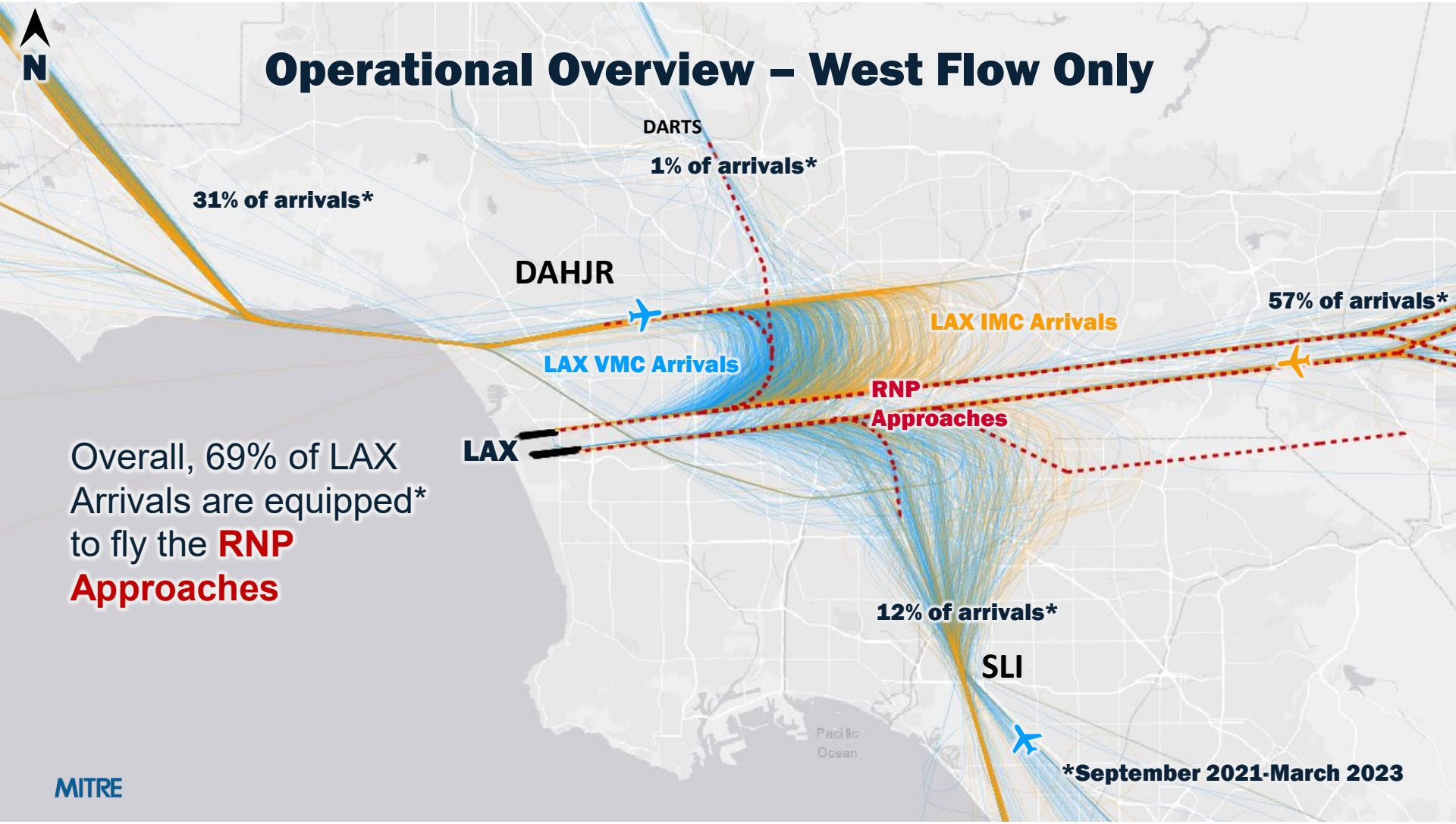


PBN RNP Equipage= Reduced Flight Distance and Flight Time

Data Communication Equipage= Earlier Departure During Rerouting Events, and overall system efficiency

ADS-B Out Equipage= Reduced spacing/distance flown

LAX: ESTABLISHED ON RNP (EOR) INITIATIVE

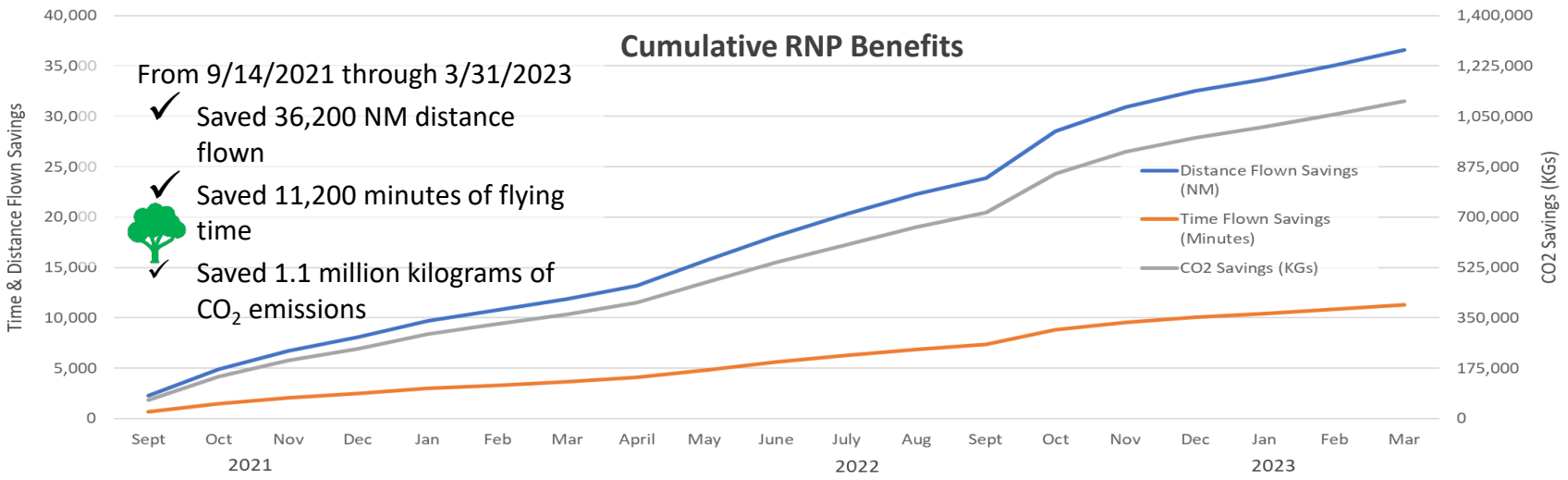

N
Operational Overview – West Flow Only
DARTS
1% of arrivals*
31% of arrivals*
DAHJR
57% of arrivals*
LAX IMC Arrivals
LAX VMC Arrivals
RNP
Approaches
LAX
Overall, 69% of LAX Arrivals are equipped* to fly the RNP Approaches
12% of arrivals*
SLI
Pacific Ocean
*September 2021-March 2023
MITRE

Monthly Curved RNP (RF) Usage – West Configuration Only

RNP RF Benefits – West Flow

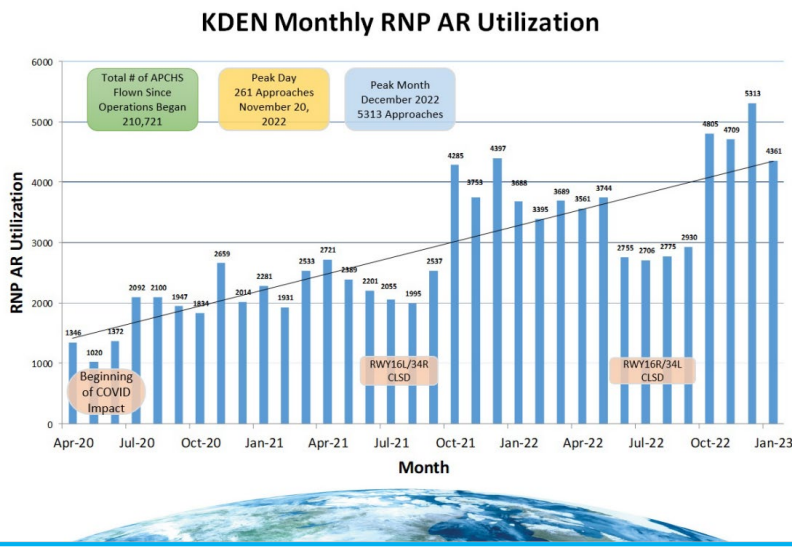
Flight Efficiency Improvements for RNP RF vs Non-RNP Approach Operations

	Savings per Flight			
VMC/IMC	**Distance Flown (NM)**	**Time Flown (Minutes)**	**Fuel Burn (Gallons)**	**CO_2 Emissions (kgs)***
VMC	**2.5**	**0.8**	**9.1**	**81.0**
IMC	**6.6**	**2.1**	**20.2**	**174.5**

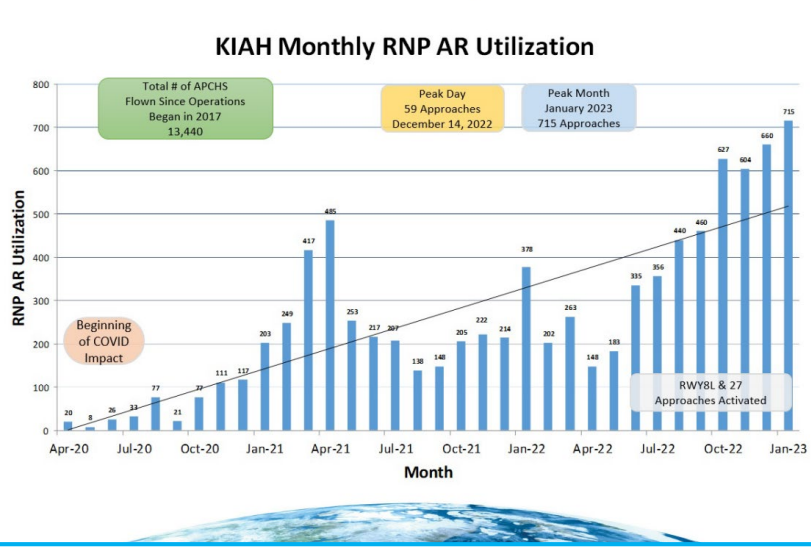


Other Locations Using Curved RNP Approaches

DEN Count – January 2023



IAH Count – January 2023



ZOA: ADS-B OUT, 5NM TO 3NM REDUCED SEPARATION INITIATIVE

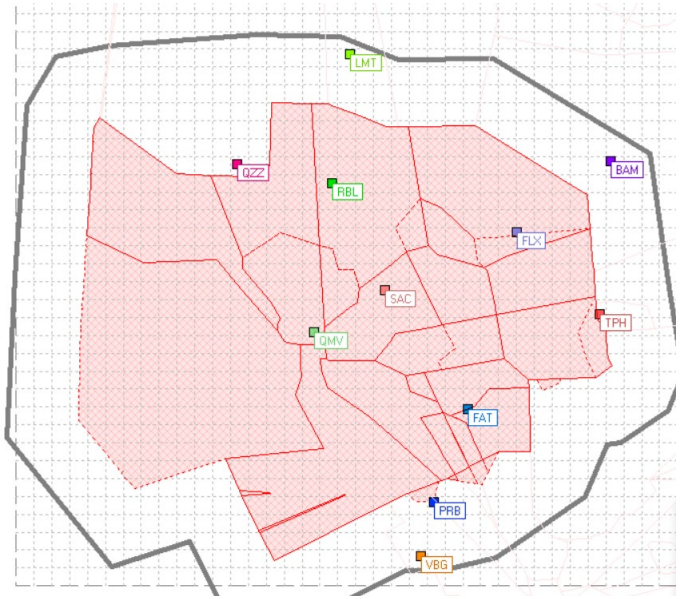
Reduced Separation from 5NM to 3NM using ADS-B Out Equipage

Adapted for 3NM Separation (FL230 and below)

12/31/2020

Adapted for 3NM Separation (FL230 and below)

10/12/2021

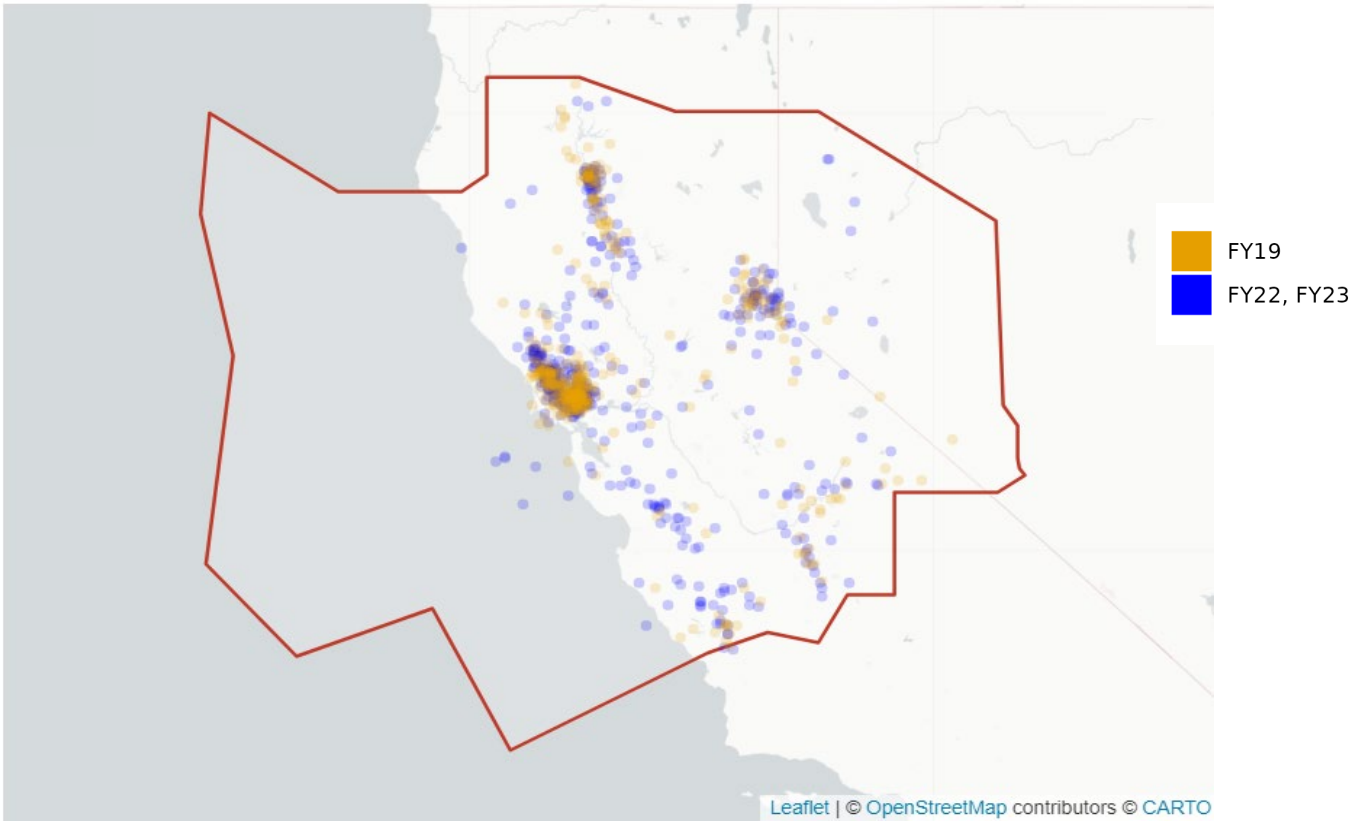


Automation changes enabled more consistent use of 3NM separation at low altitudes within ZOA.

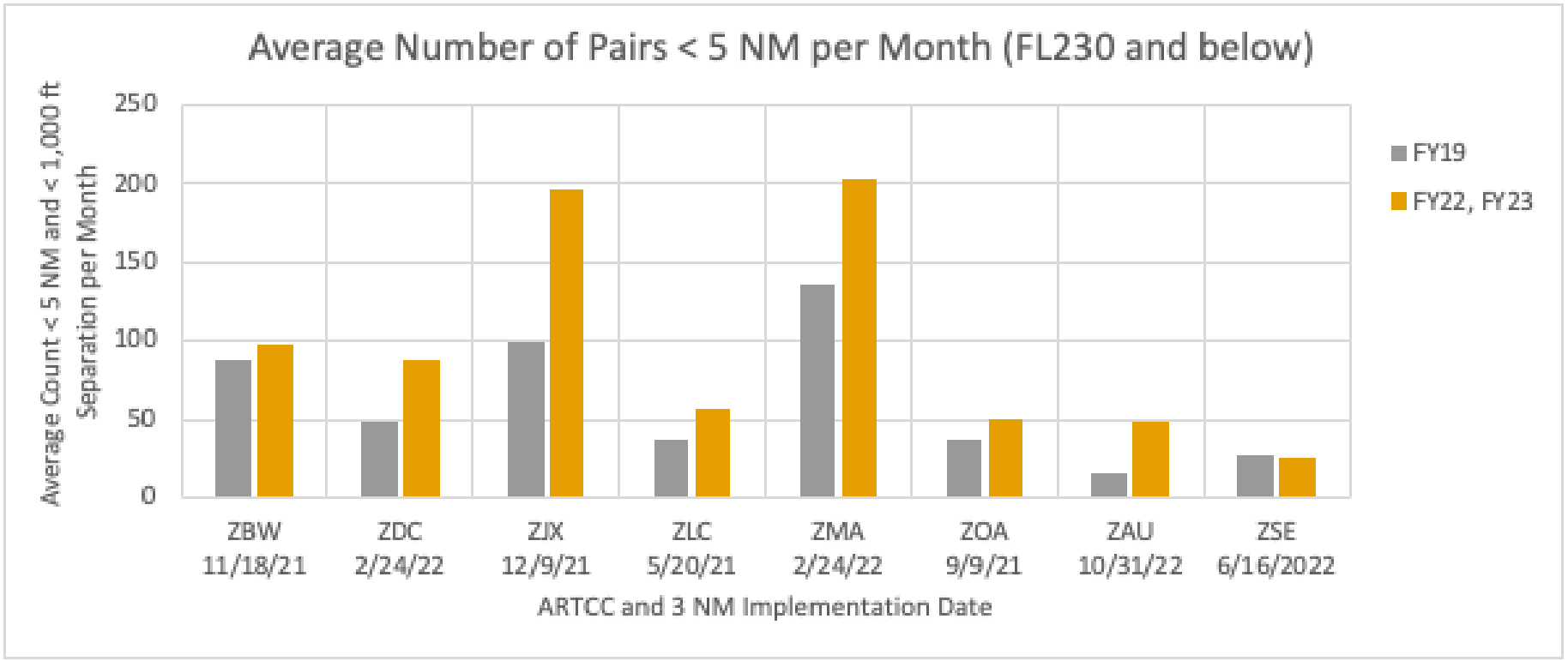
62

ZOA Opportunities to Use 3NM Separation Standard

Blue areas represent an increase in opportunities to reduce separation from 5NM to 3NM

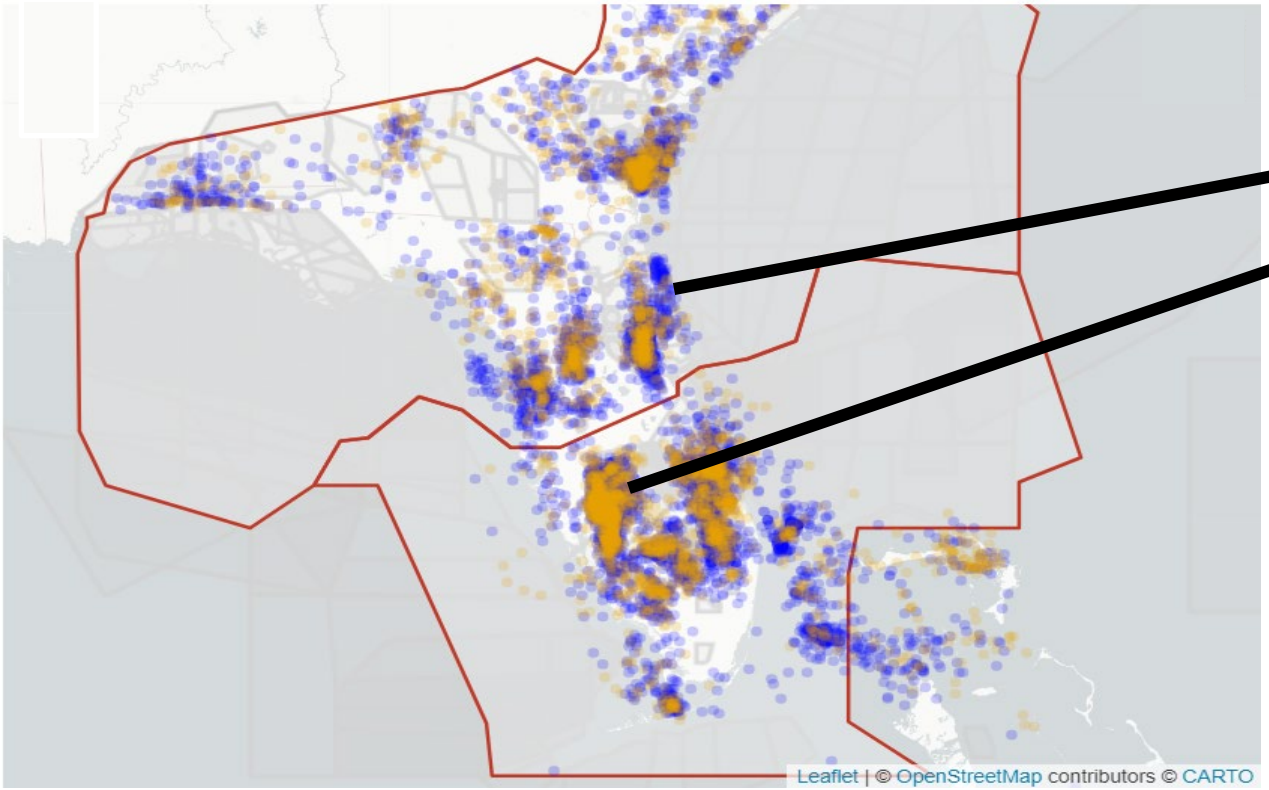


All ARTCCs with 3NM Separation Implemented



Note: Includes some VFR aircraft

ZMA & ZJX Pre-Implementation v. Post-Implementation

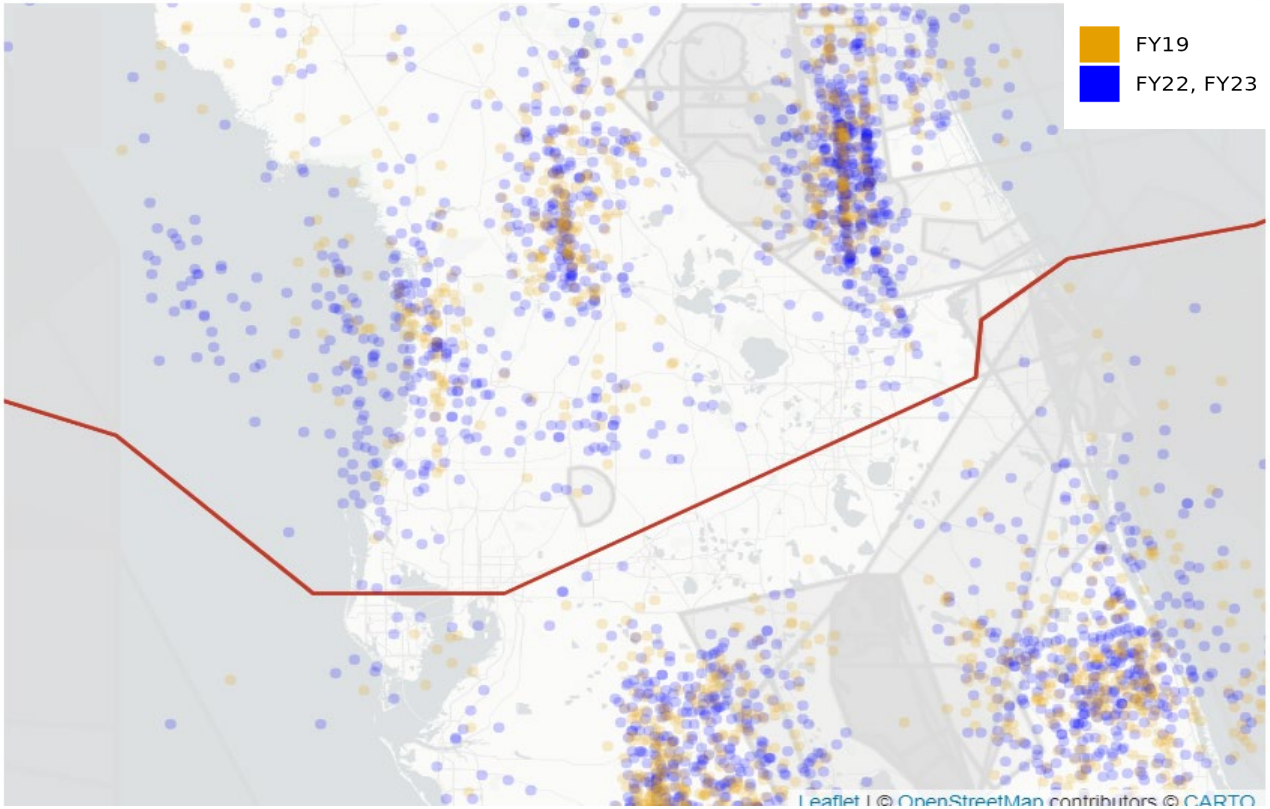


Opportunities increased where capacity of airspace constrains flow and lateral separation is used more frequently

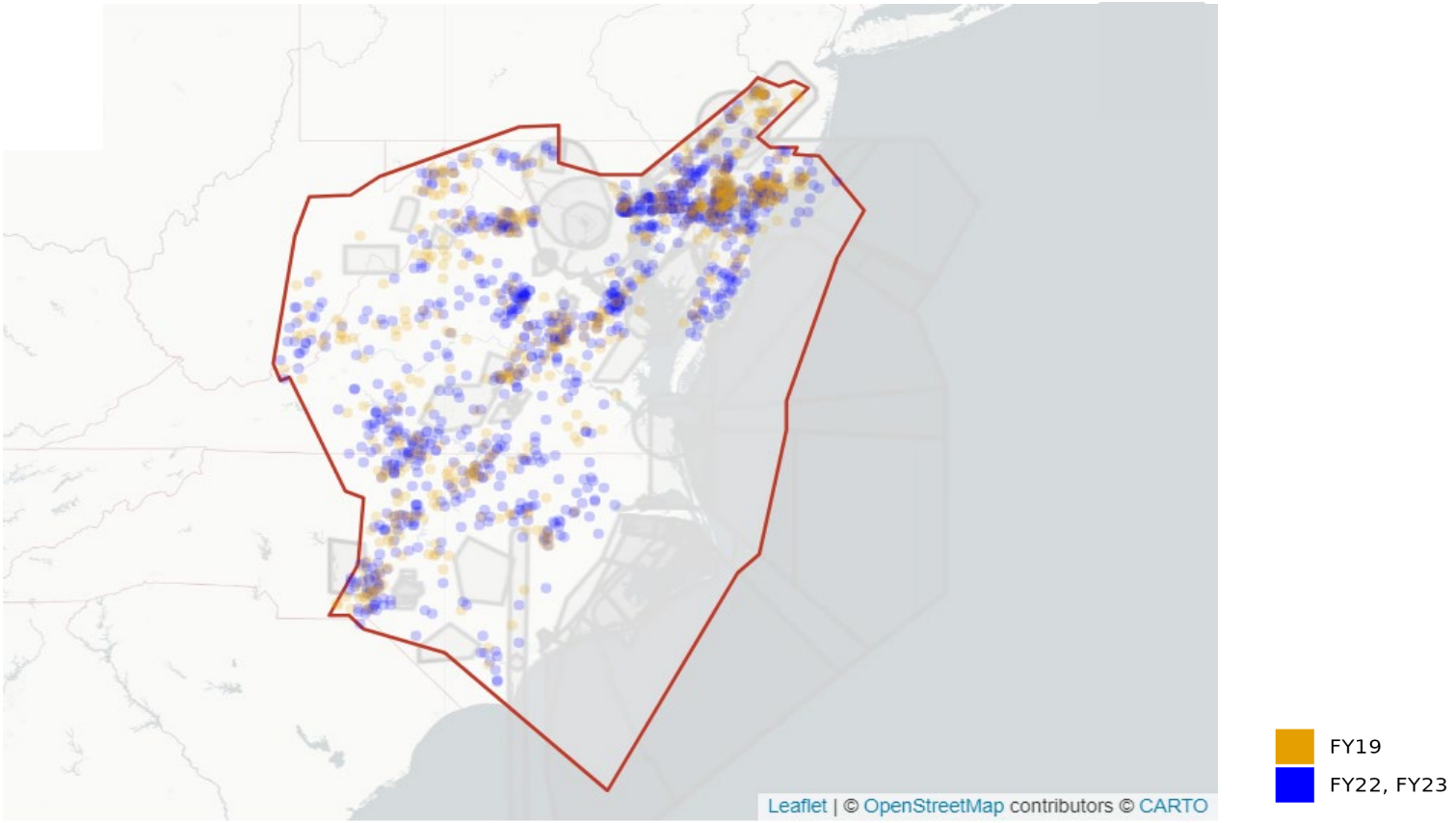
FY19
FY22, FY23

ZMA and ZJX Zoom

Opportunities increased close to center boundary because of uniform separation standard



ZDC Pre-Implementation v. Post-Implementation



MCO: CPDLC DEPARTURE CLEARANCE INITIATIVE

Section 547 Data Comm: Orlando Metrics

April 2023

L3HARRIS

Federal Aviation Administration

Initiative Description

CPDLC Departure Clearance (DCL) **capabilities at Orlando International Airport** (MCO)

- **Overview**

  Use of DCL can provide CPDLC equipped operators revised departure clearances in a more time-efficient manner compared to unequipped operators. This is especially beneficial when reroutes are necessary due to weather or other air traffic disruptions.

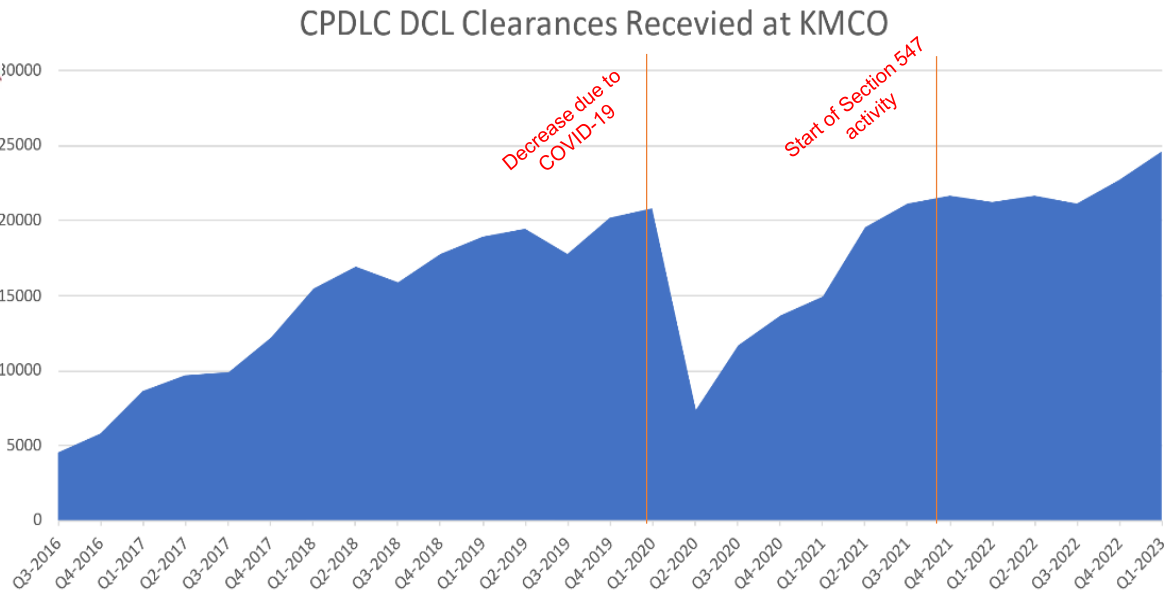
- **Anticipated Benefits**

  Minutes of Airspace User Time Saved and kilograms of CO_2 Emissions Prevented

- **Start Date**

  Focused data collection and metric tracking beginning 9/1/2021

Orlando CPDLC DCL Departures

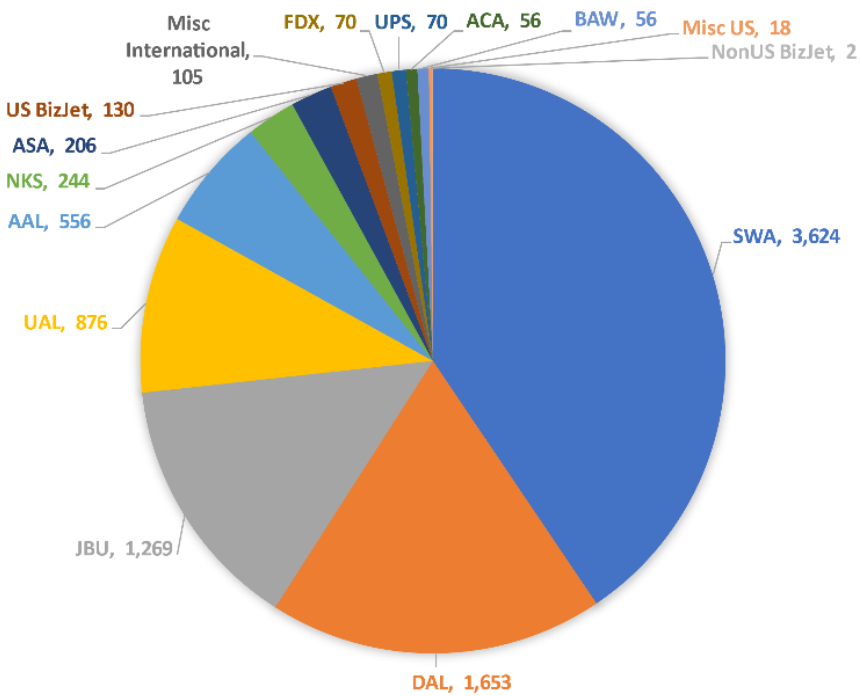


AIR CANADA
Alaska
American Airlines
AMERIJET INTERNATIONAL AIRLINES
Aer Lingus
BRITISH AIRWAYS
DELTA
Emirates
FedEx
HAWAIIAN AIRLINES
jetBlue
KALITTA AIR
LATAM AIRLINES
Lufthansa
NATIONAL
Southwest
spirit
TAM
UNITED
ups

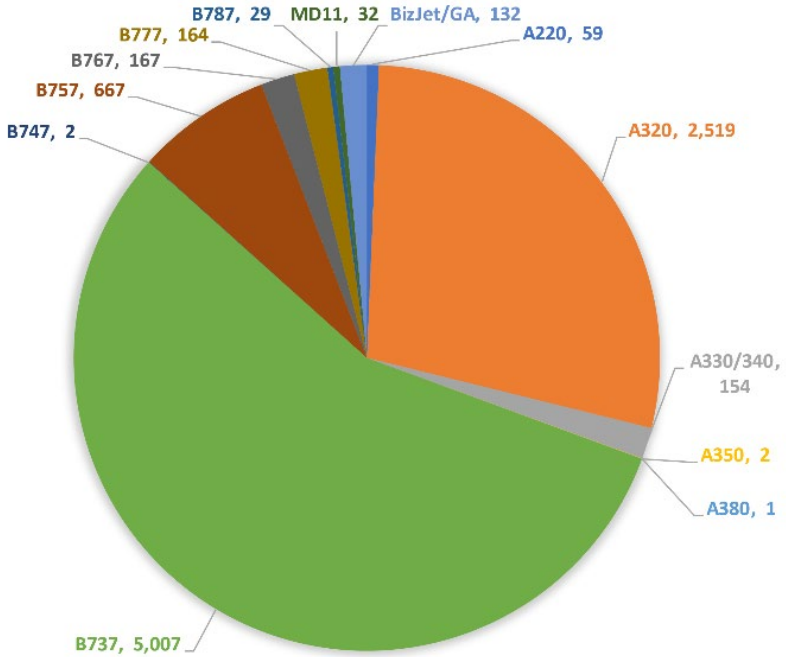
Orlando CPDLC DCL Clearances

April 2023

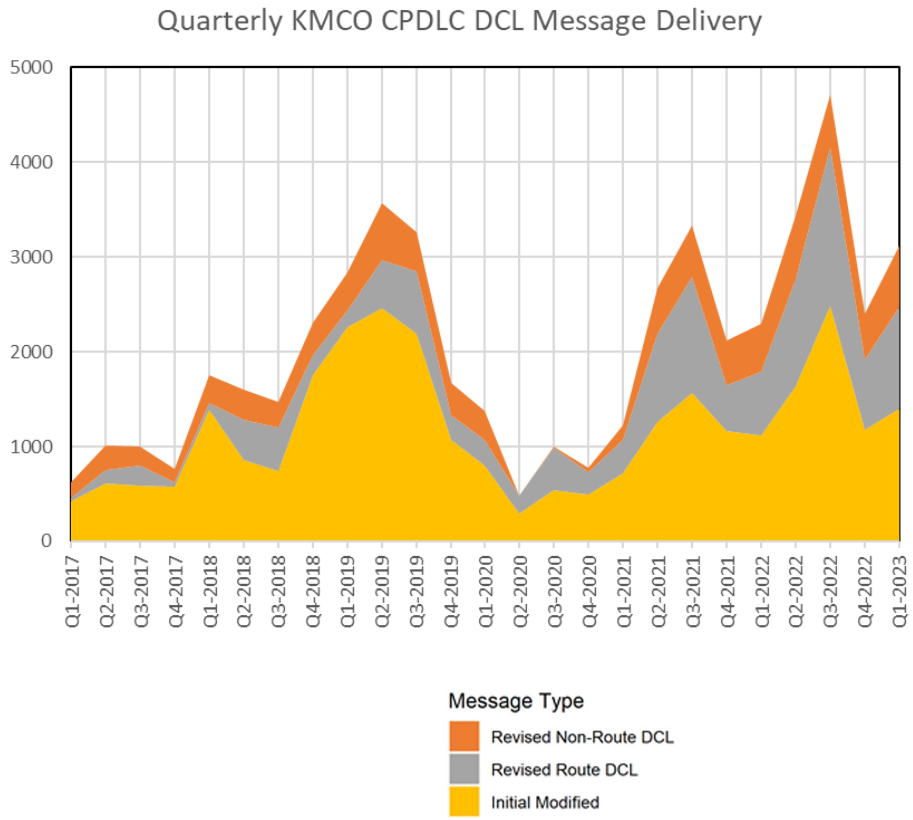
By Operator



By Aircraft Type



Orlando CPDLC DCL Messages Delivered



Cleared as Filed	The participating flight receives no changes/modifications to their original/intended route of flight filed in their flight plan.
Initial Modified	The participating flight receives a change to their original/intended route of flight on the filed flight plan, this change could be a route or non-route change.
Revised Route DCL	The participating flight receives a change/modification to their original/intended route of flight on the filed flight plan that resulted in a route change from air traffic control.
Revised Non-Route DCL	The participating flight receives a change to their original/intended route of flight on the filed flight plan. This change/modification only affected non-route information such as, but not limited to, squawk code or departure frequency.

Orlando CPDLC DCL Benefits

Since January 2021

- Cleared 170,338 flights
- Saved 35,193 minutes of airspace user time (gate and taxi)
- Prevented 959,145 kgs of CO_2 Emissions

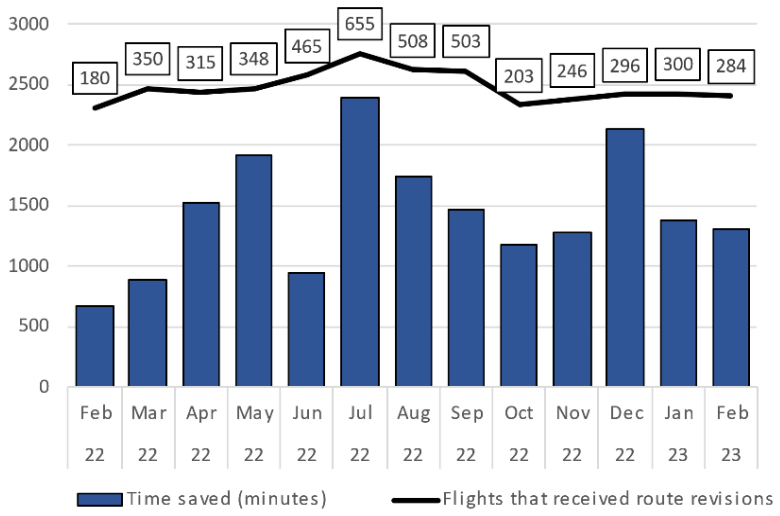
In February 2023

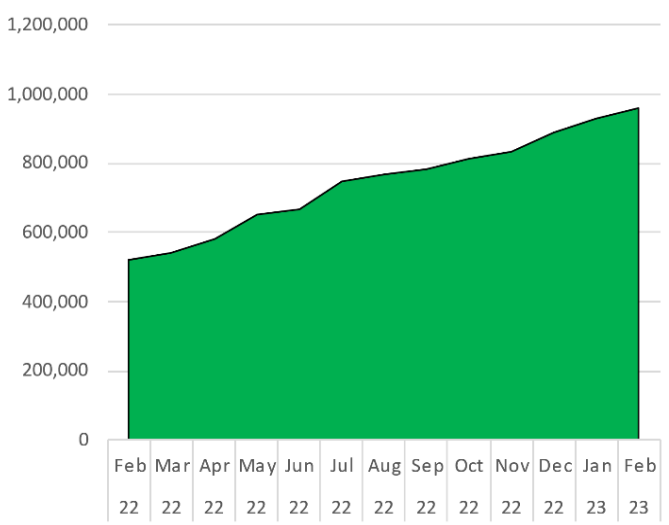
- Cleared 7,516 flights
- Saved 1,307 minutes of airspace user time (gate and taxi)
- Prevented 28,929 kgs of CO_2 Emissions

**Benefits are derived using ASPM data which is verified 3 months after the month closes.*

Orlando CPDLC DCL Benefits Trend

Time Savings and Emission Reductions





**Benefits are derived using ASPM data which is verified 3 months after the month closes.*

DFO Comments

Katie Thomson, Delegated NAC Designated Federal Officer (FAA)

Review of Action Items & Other Business

Kimberly Noonan, NAC Committee Manager (FAA)

Upcoming Meetings

- **NAC**
  - October 4, 2023 (1:00pm - 4:00pm ET) - Hybrid

Closing Comments & Adjourn

Chip Childs, NAC Chair

President & CEO (SkyWest Airlines)