

# CADENA Planned Airway System Alternatives (PASA) end-to-end Route Optimization and FRA

For: ICAO

Date: October 7, 2021

# CANSO ATFM Data Exchange Network for the Americas - CADENA

CADENA is an initiative to promote and facilitate the safe and efficient movement of air traffic in the Latin America and Caribbean region through effective implementation of air traffic flow management (ATFM) and collaborative decision-making (CDM)





# CADENA Key Regional Stakeholders

## ANSPs

- EANA (Argentina)
- COCESNA (Central America)
- UAEAC (Colombia)
- ECNA (Cuba)
- DC-ANSP (Curacao)
- IDAC (Dominican Republic)
- DGAC (Ecuador)
- FAA (USA)
  - ZMA, SJU, ZHU, ATCSCC
  - Space Operations Office
- OFNAC (Haiti)
- JCAA (Jamaica)
- SENEAM (Mexico)
- TTCAA (Trinidad & Tobago)
- INAC (Venezuela)

## State/Territory/Group

- ANSA (Aruba)
- DGAC (Costa Rica)
- MWCR (Grand Cayman)
- CARRG (Caribbean Aviation Resilience and Recovery Group)



# High Level History of Collaboration

- Aug 2016: 1<sup>st</sup> CADENA meeting in Havana
- Oct 2016: 2<sup>nd</sup> CADENA meeting in Buenos Aires  
CADENA Members trained and practiced the weekly operational planning web conference that started in Dec 2016
- Dec 6, 2016: CADENA member CEOs/COOs signed the historic “CADENA Member ANSP Air Traffic Management and Collaborative Decision-Making Letter of Agreement”
- Dec 3, 2020: CADENA the LAC3 signed a first regional Letter of Agreement to coordinate the exchange of information with the FAA ATO Space Operations office and facilitate the safe and efficient movement of space launch and recovery operations between and through participating ANSP FIRs

# CADENA Accomplishments

- Established the **CADENA RIG** –ANSPs, airlines, organizations
- Forms and templates such as ATFM Daily Plan and Contingency Checklists
- **Weekly Operational Web Conferences**
- Ad Hoc Web Conferences
- Documents such as the CADENA Procedures Manual
- **CADENA OIS**
- Communication – meetings, email notifications, WhatsApp
- **Planned Airway System Alternatives (PASA)** (pre-established contingency routes)
- **PASA end-to-end routes** (requested end-to-end routes on an ad hoc basis)
- **PASA optimized routes** (PBN and DCT as requested by the airlines)
- **Future - CANSO-IATA Free Route Airspace System initiative (CIFRAS)**
- **CADENA Training**

# Step-by-Step: From PASA to Regional FRA

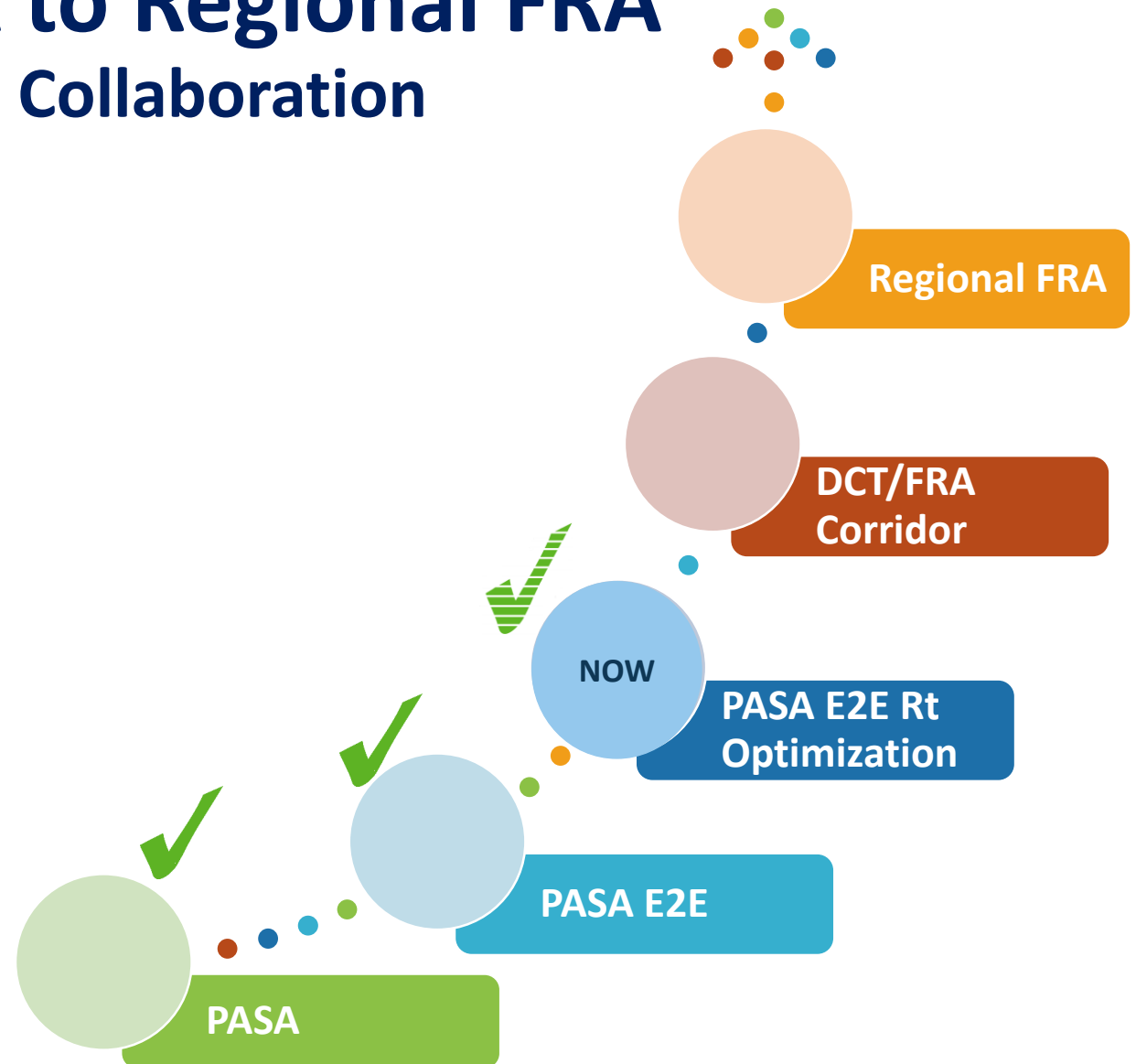
## CANSO IATA FRA System (CIFRAS) Collaboration

Do your best under the  
given circumstances!

Move on to AIP route

### GANP/ASBU Elements

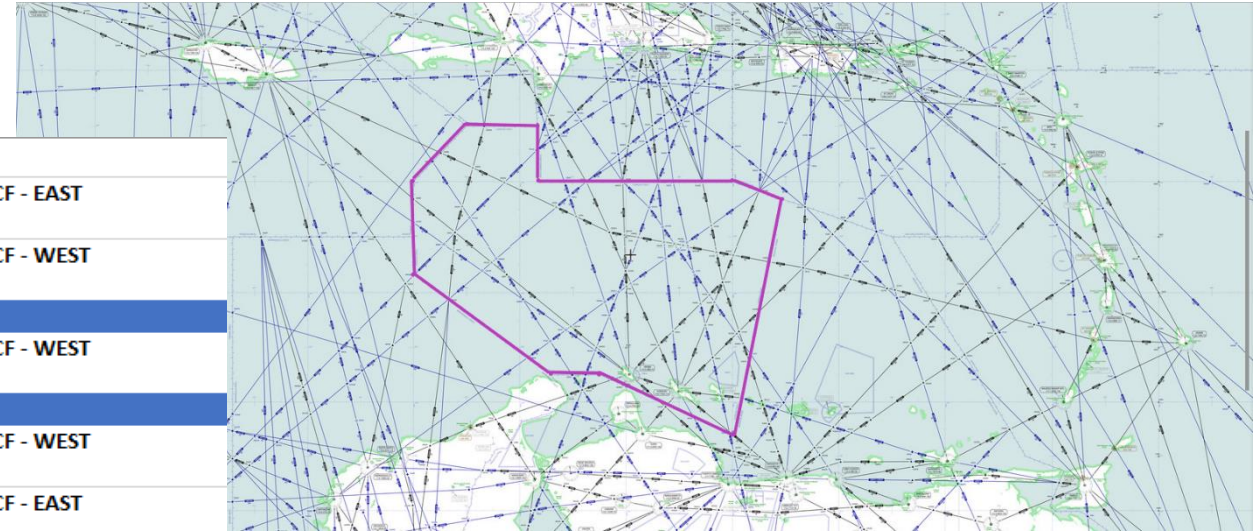
FRTO-B0/1 (DCT routing)  
FRTO-B1/1 (FRA)  
FRTO-B1/2 (RNP routes)





# PASA pre-established contingency routes

ORIG	DEST	NORTHBOUND	
SBGR	KMIA	... <b>UKBEV UZ26 BSI</b> UZ26 BEL UA555 TRAPP UL454 ILURI A555 COY RTE4 BQN A636 KATOK UA636 PTA L463 JUELE ...	AVOID TNCF - EAST
SBGR	KMIA	... <b>UKBEV UL201 ASTOB</b> UL201 ISVOM UM656 BUVKA UM656 BNS UR640 MLY UL417 LENAX UL795 BEXEN UM347 ZEUSS ...	AVOID TNCF - WEST
SBGR	KATL	... <b>UKBEV UL201 ASTOB</b> UM417 MOTVI UM549 MTU UM782 LONAX UL417 LENAX UL795 BEXEN UM347 ZEUSS Y217 OCTAL Q77 <b>ETORE</b> SHRKS LAIRI ...	AVOID TNCF - WEST
SBGR	KJFK	... <b>UKBEV UL201 ASTOB</b> ABIDE UM782 MTU UQ108 OTAMO UA301 MLY UL417 BORDO B760 ZBV RAMJT AR18 DIW ...	AVOID TNCF - WEST
SBGR	KJFK	... <b>UKBEV UZ26 BSI</b> UL452 ACARI UA312 LEPOD UG449 ANADA G449 DDP G431 ELMUC LAMER L453 PAEPR HOB OH SILLY ...	AVOID TNCF - EAST
SBGR	KJFK	... <b>UKBEV UL201 ASTOB</b> ABIDE UM782 MTU UQ108 OTAMO UA301 MLY UL417 BORDO B760 ZBV RAMJT AR18 DIW ...	AVOID TNCF - WEST
SBGR	KIAH	... <b>SCB UM415 EVNES</b> ABIDE UM782 TAKUX DCT SUVUM UM782 KEHLI ...	AVOID TNCF - WEST
SKBO	KMIA	... KOMBO UW1 PIE UW34 LFA UW8 BRM UW14 BNA DAREK UA561 GND UA324 FOF UA312 ANU G633 COY RTE4 BQN A636 KATOK UA636 ALBBE ...	AVOID TNCF - EAST
SKBO	KMIA	... GIKPU UQ120 PADUD DAGAN UL542 OTAMO UA301 MLY UL417 NEFTU UR625 ENAMO ...	AVOID TNCF - WEST
SKBO	KMIA	... PIE UW34 LFA UW8 <b>BRM PBL MIQ UDIMA MEGIR POS GND</b> UA324 FOF UA312 ANU G633 COY RTE4 BQN A636 KATOK UA636 ALBBE ...	AVOID TNCF - SOUTH AND EAST



**Equipment Issues**




**ATC Zero**

# PASA end-to-end route request capability

**CADENA OIS**

- Main
- Weekly Conf
- Hurricane Conf
- Contingency Form
- ADP Link Files
- PASA Route Requests**
- Contact List
- Lessons Learned
- CADENA Manual



Delta Air Lines

Español [Chat 1](#) [? Help](#) [Settings](#) [Logout](#)

▼ Create new PASA Route Request

To ANSP(s) Send to ▼

Flight #

Requestor

Flight Date

City Pair


Dept Time  :  UTC

En-Route ☐

Route

[Plot](#) [Save as Template](#) [Submit](#)

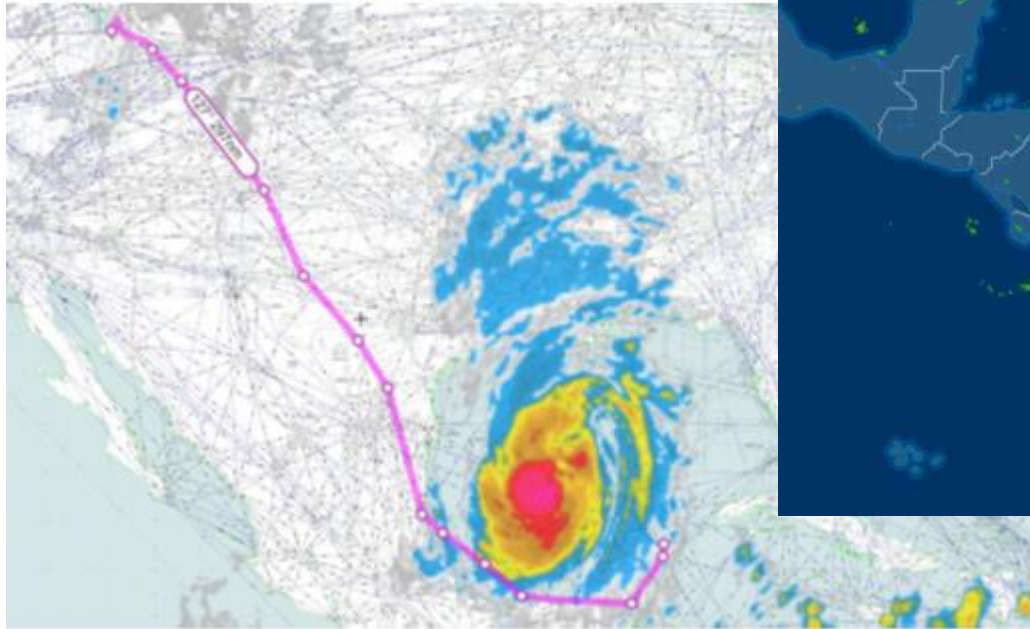
Some locations or airways in the route ISREN2F, Y183, Q87, Q77, JJEDI2 are not found in the System. They are ignored in the plotting, but the route request can still be submitted. If you think they are valid locations or airways and should be part of the System, please let Cadena Support know.





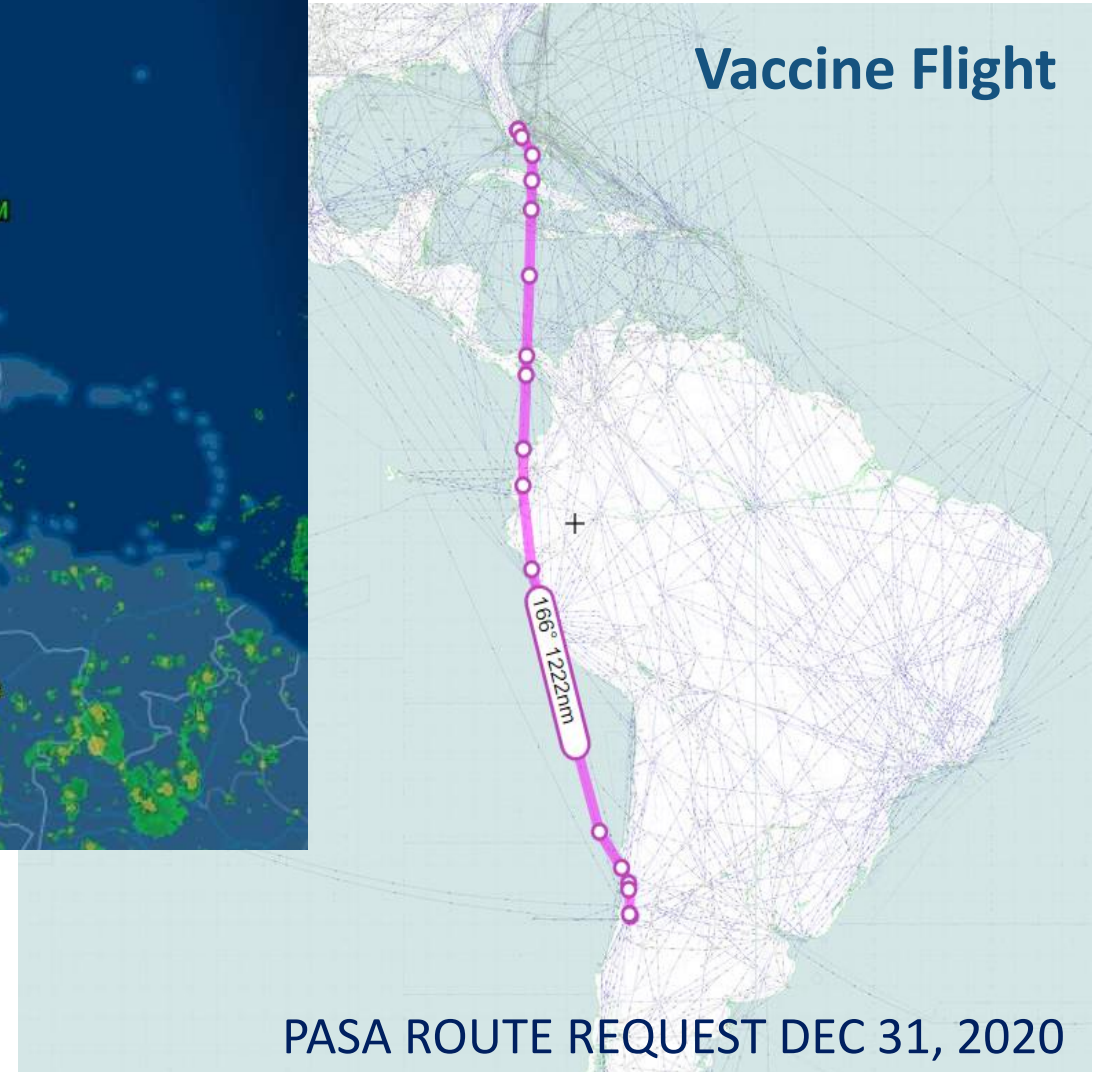
# PASA end-to-end routes – in operation

PASA ROUTE REQUEST  
NOV 16, 2020



PASA ROUTE REQUEST OCT 7, 2020

Vaccine Flight



PASA ROUTE REQUEST DEC 31, 2020

Before we visit

PASA E2E Route Optimization

## Future / Aim

### DCT/FRA Corridor

DCTs are established at national and regional levels and made available for flight planning (with published conditions of use). (FRTO-B0/1)

### Regional FRA

FRA enables airspace users to fly as close as possible to what they consider the optimal trajectory without the constraints of a fixed route network structure. (FRTO-B1/1)

# PASA E2E Route Optimization

The airlines that participate in CADENA have made it clear that significant operational benefits can be achieved by flight planning and flying an optimum end-to-end route between key city pairs in the Latin America and Caribbean Regions.

In today's operating environment, and due to the low traffic volume brought about by the COVID pandemic, flight crews often receive “direct” clearances from controllers within the FIRs they transit.

Why not be able to flight plan a route that takes advantage of the “directs” before the flight ever leaves the gate?

This will result in:

- ✓ Reduced flight time
- ✓ Fuel savings
- ✓ CO2 savings



# PASA E2E Route Optimization

**How** to implement PASA E2E Route Optimization

Phase 1: Route Prioritization Process with Airlines  
(**Completed**) – Selected pilot routes

Phase 2: FRA plus Airport Readiness Process (**Ongoing**)

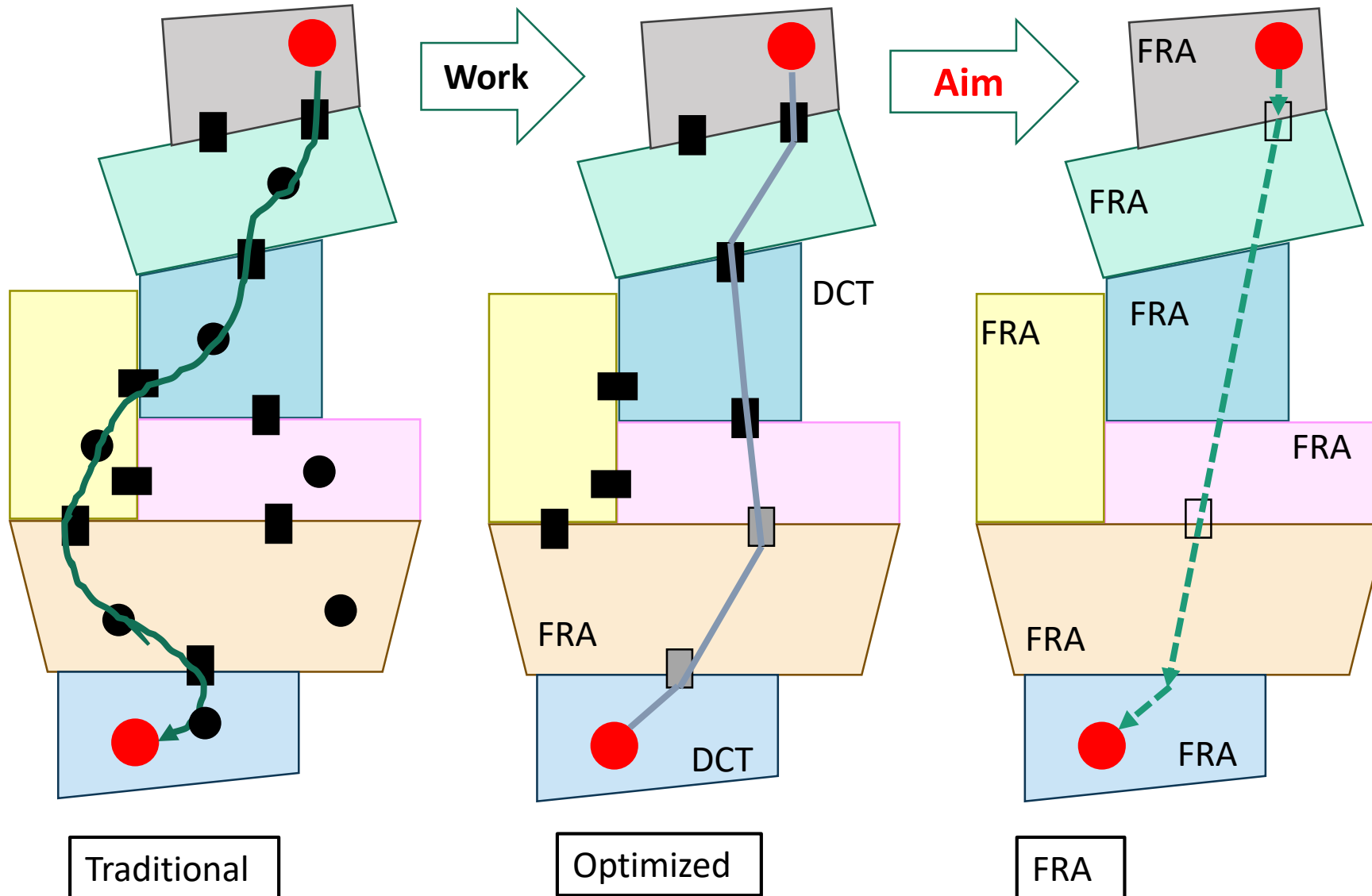
Phase 3: PASA Optimized E2E Route Validation Process  
(**Ongoing**)

Phase 4: PASA Optimized E2E Route Approval Process

Phase 5: Expand Availability of PASA Optimized E2E Routes

How?

# Transformation of Routes



How?

## Phase 1: Route Prioritization Process with Airlines – Select trial routes

- Received initial responses from the airlines regarding requests for optimized E2E routes
- Selected pilot routes to implement PASA optimized E2E routes:

- ✓ KATL → SPJC → KATL
- ✓ KATL → SBGR → KATL
- ✓ TTPP → KMIA → TTPP
- ✓ KIAH → MMPR → KIAH
- TTPP → KJFK → TTPP
- KIAH → MMSD → KIAH



# Phase 2: LAC FIR Capability Table

LAC Airspace Capability Table											
ANSP	State	Code	FIR/ACC	FRA		RVSM	Surveillance				
				DCT	FRA		Radar	ADS-C	ADS-B Ground	ADS-B Sat	RSP180
IDAC	DOM	MDCS	Santo Domingo ACC			IMP	IMP		P		
COCESNA	HND	MHTG	Central American ACC	AIC A 4/20		IMP	IMP	IMP	IMP	IMP	IMP
JCAA	JAM	MKJK	Kingston ACC	AIC A27/20		IMP	IMP				
SENEAM	MEX	MMFO	Mazatlan Oceanic ACC			IMP	IMP	P	P		
SENEAM	MEX	MMFR	Mexico ACC			IMP	IMP	P	P		
OFNAC	HTI	MTEG	Port-Au-Prince ACC			IMP	P		P	P	
ECNA	CUB	MUFH	Habana ACC			IMP	IMP				
EANA	ARG	SACF	Cordoba ACC			IMP	IMP	IMP	P	P	
EANA	ARG	SACU	Cordoba UIR			IMP	IMP	IMP	P	P	
EANA	ARG	SAEF	Ezeiza ACC			IMP	IMP	IMP	P	P	
EANA	ARG	SAEU	Ezeiza UIR			IMP	IMP	IMP	P	P	
EANA	ARG	SAMF	Mendoza ACC			IMP	IMP	IMP	P	P	
EANA	ARG	SAMV	Mendoza UIR			IMP	IMP	IMP	P	P	
EANA	ARG	SARR	Resistencia ACC			IMP	IMP	IMP	P	P	
EANA	ARG	SAVF	Comodoro Rivadavia ACC			IMP	IMP	IMP	P	P	
EANA	ARG	SAVU	Comodoro Rivadavia UIR			IMP	IMP	IMP	P	P	
DGAC Ecuador	ECU	SEFG	Guayaquil ACC	ENR 1.01		IMP					
UAEAC	COL	SKEC	Barranquilla ACC	AIP ENR 1.3-1		IMP					
UAEAC	COL	SKED	Bogota ACC	AIP ENR 1.3-1		IMP					
INAC	VEN	SVZM	Maiquetia ACC	AIP C03-A03/21		IMP					
FAA*	USA	TJZS	San Juan ACC			IMP					
DC-ANSP	CUW	TNCF	Curacao ACC	AIC A05/20		IMP					
TTCAA	TTO	TTZP	Piarco ACC			IMP	IMP	IMP	P	P	P

More capability titles are shown below.

IATA Direct routing capability will be added.

Comm					RNAV/ RNP 10			RNP 4			RNP2	ADS-C CDP	ADS-B ITP	Lat Offsets for Climb or Descent	UPR	DARP	
RCP240	Latency 300	CPDLC	FMC WPR	Satvoice (SCV)	50 NM LAT	50 NM LONG	10 MIN LONG NMC	30 NM LAT	23 NM LAT.	20 NM Long.	30 NM LONG.	23 NM lateral				Accept	Initiate

AIDC											Network Optimisation			
CPL/EST	CDN	Weather Deviation	Offset	Block Level	Mach Speed	FAN/FCN	ADS forwarding	TRU Msg	Enhanced CDN	Enhanced ABI	CDM	Enroute CFM	ODP/ Tailored Arrival	Optimised Climb

# Phase 3: PASA Optimized E2E Route Validation Process

	Origin	Dest	ETE	Burn (lbs.)	Route			
<b>SOUTHBOUND</b>								
Current	ATL	LIM	6:25	69269	KATL VRSTY2 MCN YANTI Q89 SHRKS DEBRL Q97 TOVAR Y297 URSUS UG430 KILER UQ102 BOKAN UP533 QIT UM674 ATATU ATATU2 SPJC			
Requested	ATL	LIM	6:20	68468	KATL VRSTY2 MCN URSUS SIA ARNOK TOSES ATATU ATATU2 SPJC			
<b>SOUTHBOUND COORDINATION</b>								
		SENT	RECEIVED	ACC/FIR	CURRENT ROUTE	REQUESTED ROUTE	APPROVED	IF NO, OPTIONS
				KZTL	KATL VRSTY2 MCN YANTI	REQUEST: <b>KATL VRSTY2 MCN URSUS</b>	NO	
				KZJX	YANTI Q89 SHRKS DEBRL	REQUEST: <b>KATL VRSTY2 MCN URSUS</b>	NO	
		1/18/2021		KZMA	DEBRL Q97 TOVAR Y297 URSUS	REQUEST: <b>MCN URSUS</b>	NO	
		1/18/2021		MUFH	URSUS UG430	REQUEST: <b>URSUS SIA</b>		
		1/18/2021		MKJK	UG430 KILER	REQUEST: <b>URSUS SIA ARNOK</b>		
		1/18/2021		MPZL		REQUEST: <b>SIA ARNOK</b>		
		1/18/2021		SKEC	KILER UQ102		N/A	
		1/18/2021		SKED	UQ102 BOKAN	REQUEST: <b>SIA ARNOK</b>		
		1/18/2021		SEFG	BOKAN UP533 QIT UM764	REQUEST: <b>SIA ARNOK TOSES</b>		
		1/18/2021		SPIM	UM764 ATATU ATATU2 SPJC	NO CHANGE	N/A	
<b>NORTHBOUND</b>								
Current	LIM	ATL	6:34	72701	SPJC ATATU2F ATATU UM674 TBG UL465 ARNAL ATUVI UG448 IKBIX Y183 PEAKY Q87 MATLK Q77 SHRKS LAIRI LARZZ JJEDI2 KATL			
Requested	LIM	ATL	6:31	71900	SPJC ATATU2F ATATU TOSES ENSOL TOKUT IKBIX LARZZ JJEDI2 KATL			
<b>NORTHBOUND COORDINATION</b>								
		SENT	RECEIVED	ACC/FIR	CURRENT ROUTE	REQUESTED ROUTE	APPROVED	IF NO, OPTIONS
		1/18/2021	1/21/2021	SPIM	SPJC ATATU2F ATATU UM674	REQUEST: <b>SPJC ATATU2F ATATU TOSES</b>	YES	
		1/18/2021		SEFG	ATATU UM674	REQUEST: <b>TOSES ENSOL</b>		
		1/18/2021		SKED	ATATU UM674	REQUEST: <b>ENSOL TOKUT</b>		
		1/18/2021		MPZL	ATATU UM674 TBG UL465 ARNAL	REQUEST: <b>TOKUT IKBIX</b>		
		1/18/2021		MKJK	ARNAL ATUVI	REQUEST: <b>TOKUT IKBIX</b>		
		1/18/2021		MUFH	ATUVI UG448 IKBIX	REQUEST: <b>TOKUT IKBIX</b>		
		1/18/2021		KZMA	IKBIX Y183 PEAKY Q87 MATLK	REQUEST: <b>IKBIX LARZZ</b>	NO	
				KZJX	MATLK Q77 SHRKS LAIRI	REQUEST: <b>IKBIX LARZZ</b>	NO	
				KZTL	LAIRI LARZZ JJEDI2 KATL	REQUEST: <b>IKBIX LARZZ JJEDI2 KATL</b>	NO	

# PASA E2E Route Optimization: 90-Day Trials

## **KATL..SPJC..KATL**

KATL..SPJC: DAL151  
SPJC..KATL: DAL150

**July 9 to October 7, 2021**

## **KATL..SBGR..KATL**

KATL..SBGR: DAL105  
SBGR..KATL: DAL104

**July 26 to October 25, 2021**

## **TTPP..KMIA..TTPP**

TTPP..KMIA: BWA484  
KMIA..TTPP: BWA483

**August 6 to November 4, 2021**

## **KIAH..MMPR..KIAH**

KIAH..MMPR: UAL1622, UAL304, UAL306  
MMPR..KIAH: UAL1632, UAL234, UAL307

**September 1 to November 30, 2021**

## **KIAH..MMSD..KIAH**

**Coming soon**



# Benefits: PASA E2E Route Optimization 90-Day Trials

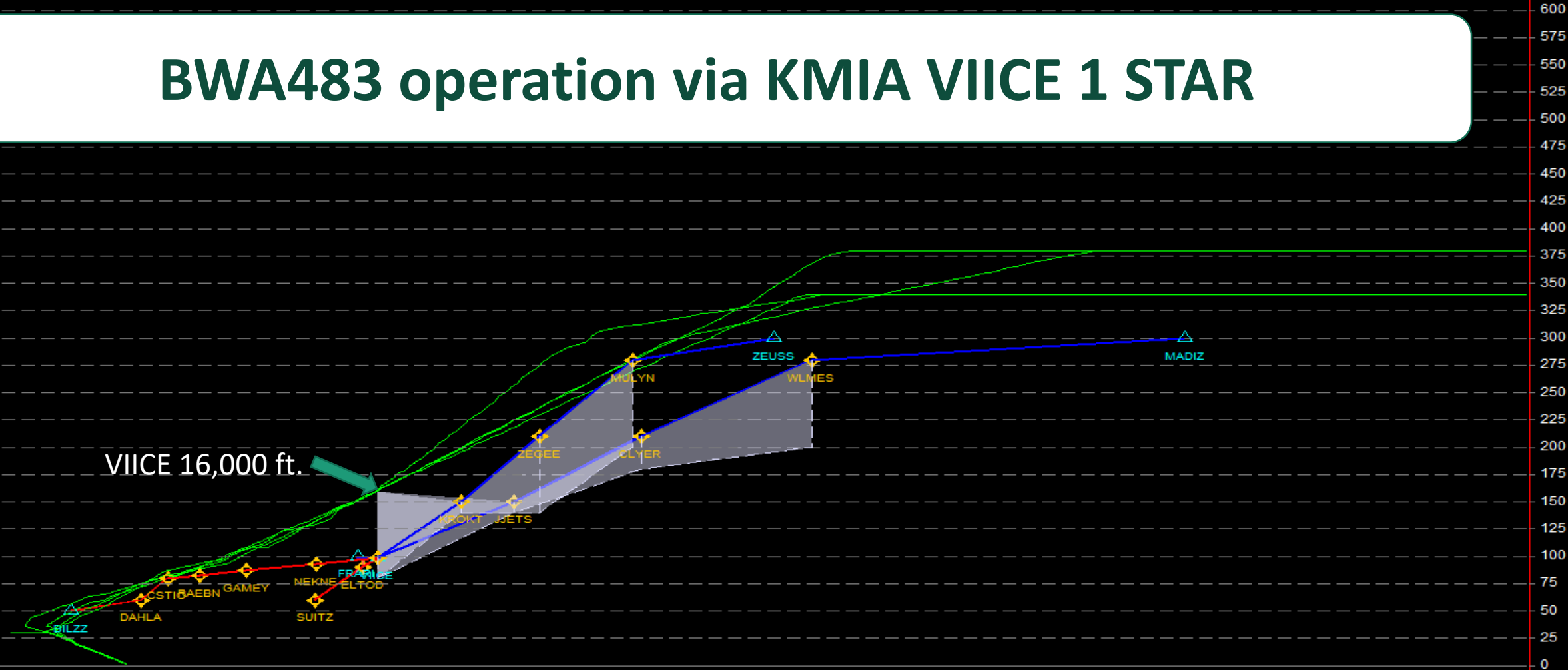
KATL..SPJC..KATL 90-Day Trial until Oct 7		
Data duration:	Jul 9 - Sep 6 (74 days)	
Saved minutes:	414 minutes	
Saved fuel:	122,403	lb
Saved CO2:	175,447	kg
Saved Ops cost:	\$ 77,756 (USD)	

KATL..SBGR..KATL 90-Day Trial until Oct 25		
Data duration:	Jul 27 - Sep 6 (56 days)	
Saved minutes:	194 minutes	
Saved fuel:	52,702	lb
Saved CO2:	75,541	kg
Saved Ops cost:	\$ 35,053 (USD)	

TTPP..KMIA..TTPP 90-Day Trial until Nov 4		
Data duration:	Aug 6 – Sep 20 (46 days)	
Saved minutes:	114 minutes	
Saved fuel:	16,125	lb
Saved CO2:	23,113	kg
Saved Ops cost:	\$ 16,189 (USD)	

KIAH..MMPR..KIAH 90-Day Trial until Nov 30		
Data duration:	Sep1 – Sep 21 (21 days)	
Saved minutes:	129 minutes	
Saved fuel:	11,900	lb
Saved CO2:	17,057	kg
Saved Ops cost:	\$ 16,772 (USD)	

# BWA483 operation via KMIA VIICE 1 STAR



MIA VIICE 1 STAR  
AUG 28<sup>th</sup> – AUG 31<sup>st</sup> 2021  
BWA484

# Cost of Early Decent via VIICE 1 STAR

## Caribbean Airlines (BWA) reported

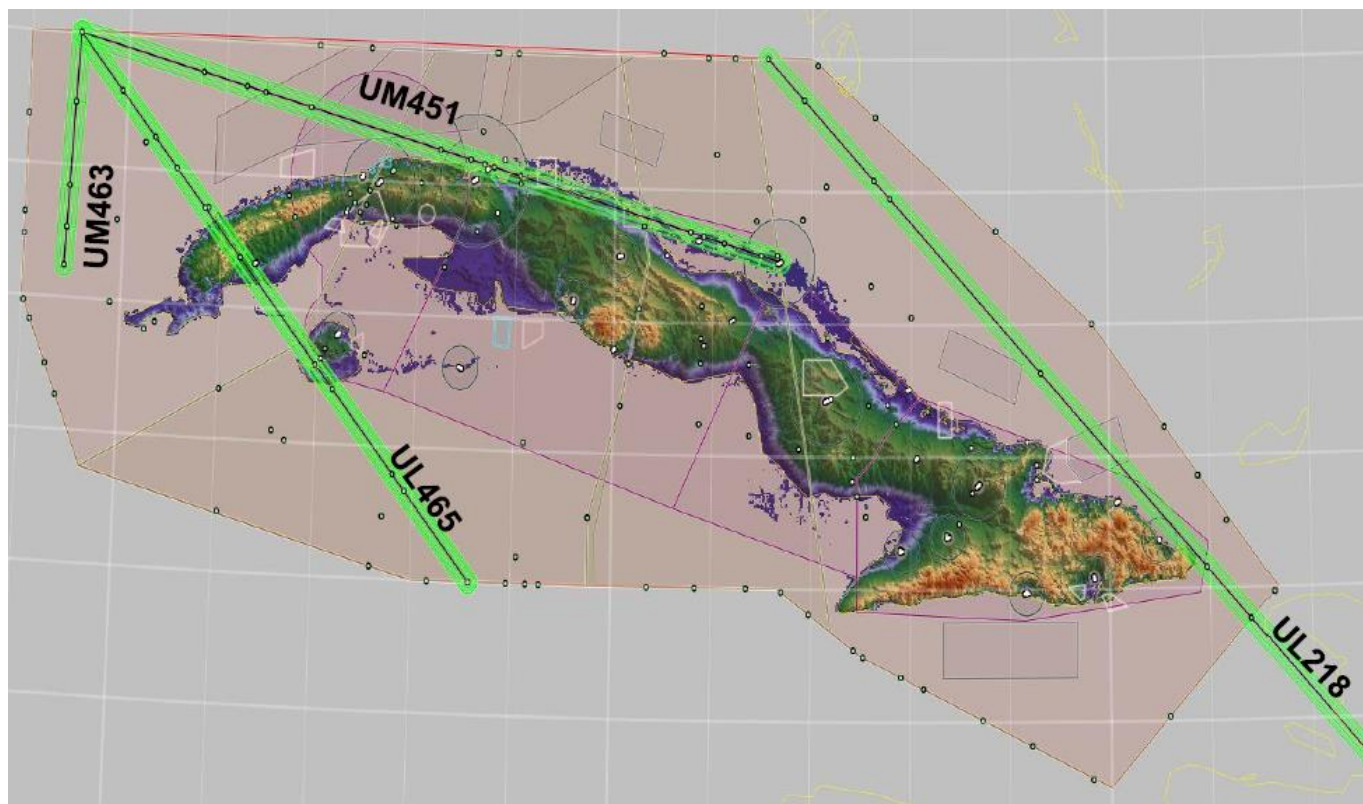
- VIICE 1 STAR is a well designed approach into KMIA
- Sometimes, the flight crew is receiving a descent clearance prior to the flight's optimum top-of-descent point
- Thus, some flights are unable to take advantage of CDO
- This results in additional fuel burn of 200kg
- 200kg fuel burn translates into:
  - \$131/per flight in fuel cost
  - 632kg of additional CO<sub>2</sub> per flight

If this early decent clearance is given one flight per day, in one year's time:

- 160,965 lb/yr (or 73,000kg/yr)
- \$47,815 /yr
- 230,680 kg of CO<sub>2</sub> /yr



ECNA created new routes and published in the June 17, 2021 AIRAC cycle.



New routes will:

- Save fuel
- Reduce CO2 emissions
- Provide option to avoid weather

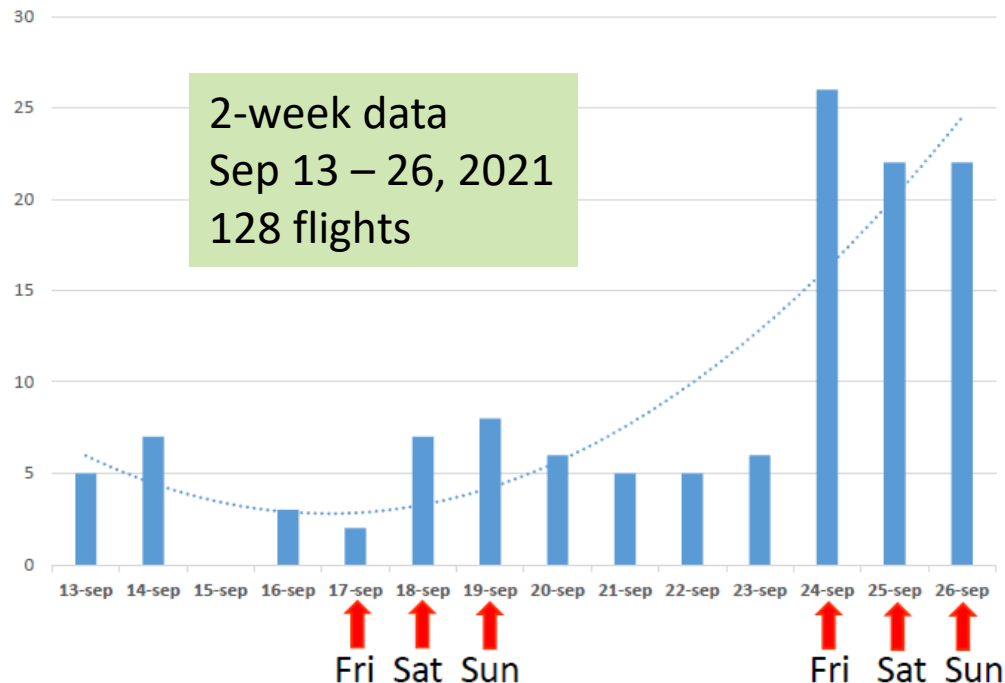
# Status of L465 to MMUN

- Houston Center and Miami Center requested additional time to coordinate the use of the new route published in the June 17, 2021 AIRAC cycle
- The inter-facility coordination was completed and use of L465 to MMUN started as a test on September 13, 2021
- CADENA Hosted an Ad Hoc WebEx on September 24, 2021 with Havana ACC, Merida ACC, Mexico City FMU, Houston ARTCC, Miami ARTCC to review the outcome of the test
  - ✓ The meeting agreed the test was a success !

# Savings Estimate of L465 to MMUN

Route	ETE	Burn	Distance	Route
Base	1:05	4723	486	CIGAR M215 PISAD UM215 NUDIS DCT ITLOM UM782 CUN
Via L465	0:56	4069	423	CIGAR M219 NAVVL L465 SHARQ UM463 WALKY UB879 CUN

OPERATIONS BY DAY



## Savings per flight:

- 9 min of ETE
- 654lb of fuel
- 90.30Kg of CO2
- \$919 in Op Cost

## Savings in one year

- 29,952 min of ETE
- 209,664lb of fuel
- 300,523Kg of CO2
- \$3M in Op Cost

Will re-estimate with additional L465 usage data.

# Questions?

# Thank you!

POC:

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