ICAO ENVIRONMENT

Operational improvements and Environment

Performance Based Navigation (PBN)

Air Traffic Management (ATM)

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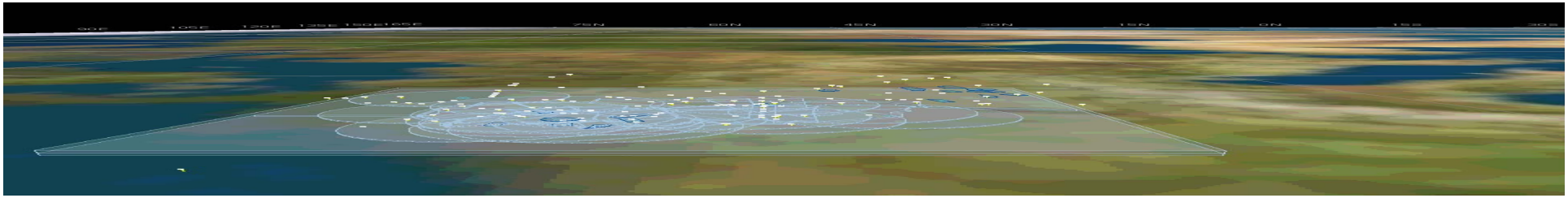
International Civil Aviation Organization

North American Central American and Caribbean Regional Office



Agenda


ICAO ENV Activities & Objectives
Evolution of air navigation
Global Perspective
PBN implementation
PBN Benefits

ICAO - ENV Activities

Improve Airport and air navigation infrastructure

(operational improvements)

-PBN

-ATFM

Improve aircraft technology;

-(A380) 3Lts x 100PAX/km = 75g /CO2 x PAX/km

-Renew aircraft fleet, 5500 a 2020

Improve fuel:

BIO - Green emissions

Reduce CO2 emissions:

2020, 21%

2050, 50%

Reduce noise level

Airports & surrounding areas






Evolution of Air Navigation

Visual Navigation

Estimated Navigation

Astronomic Navigation

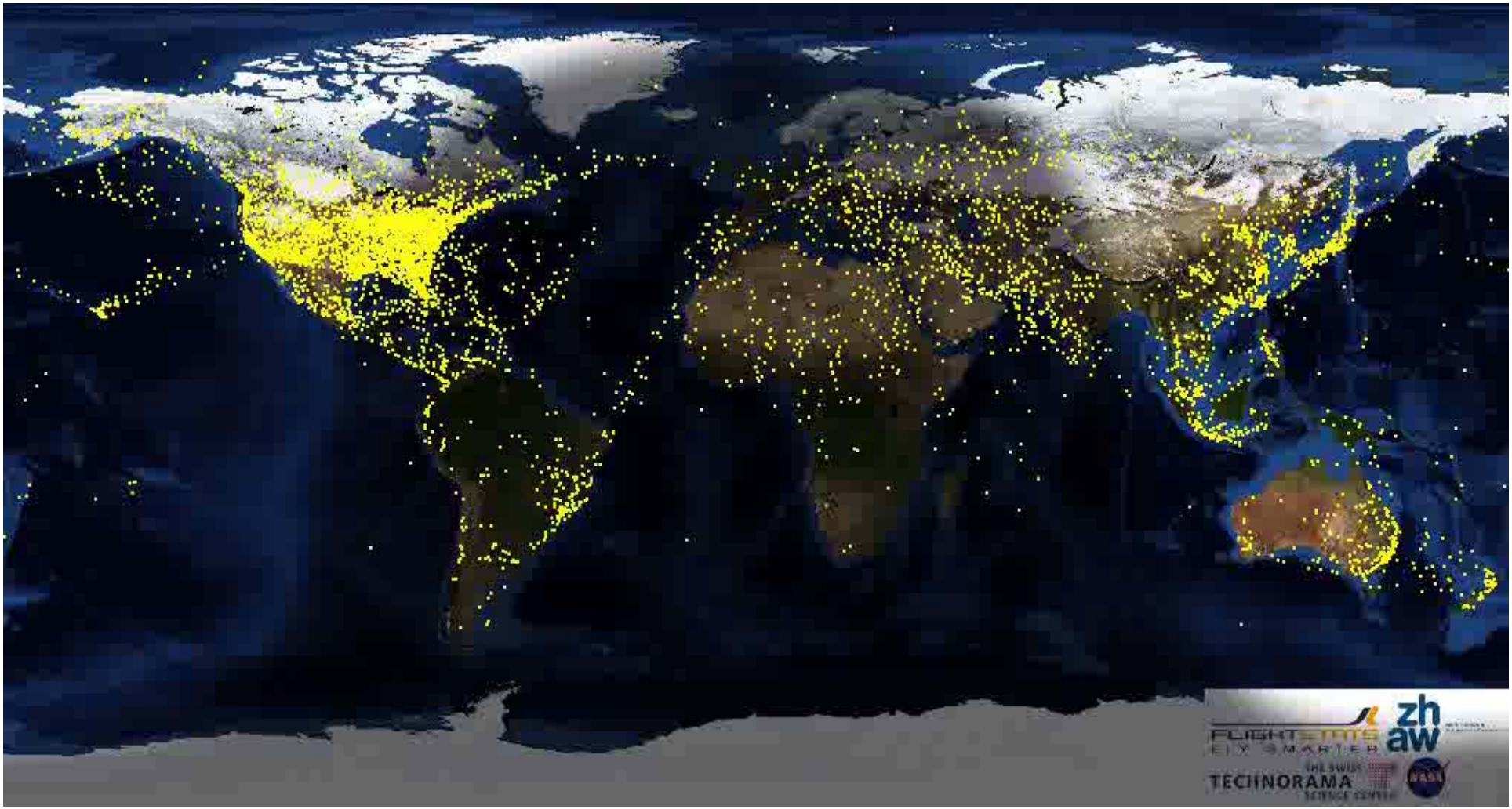
Radio Navigation (ground based - conventional)

Global Navigation Satellite System (GNSS)






Global Traffic Flows







Air Transport Grow(ICAO)

3.0 billion — *+4.7% growth rate vs. 2011*

*Passengers carried in **2012****

→

6.4 billion — *+4.4% average annual growth rate*

*Forecasted passengers carried in **2030***

31 million — *+0.7% vs. 2011*

*Aircraft departures in **2012****

→

59 million — *+3.6% average annual growth rate*

*Forecasted aircraft departures in **2030***

*Preliminary figures

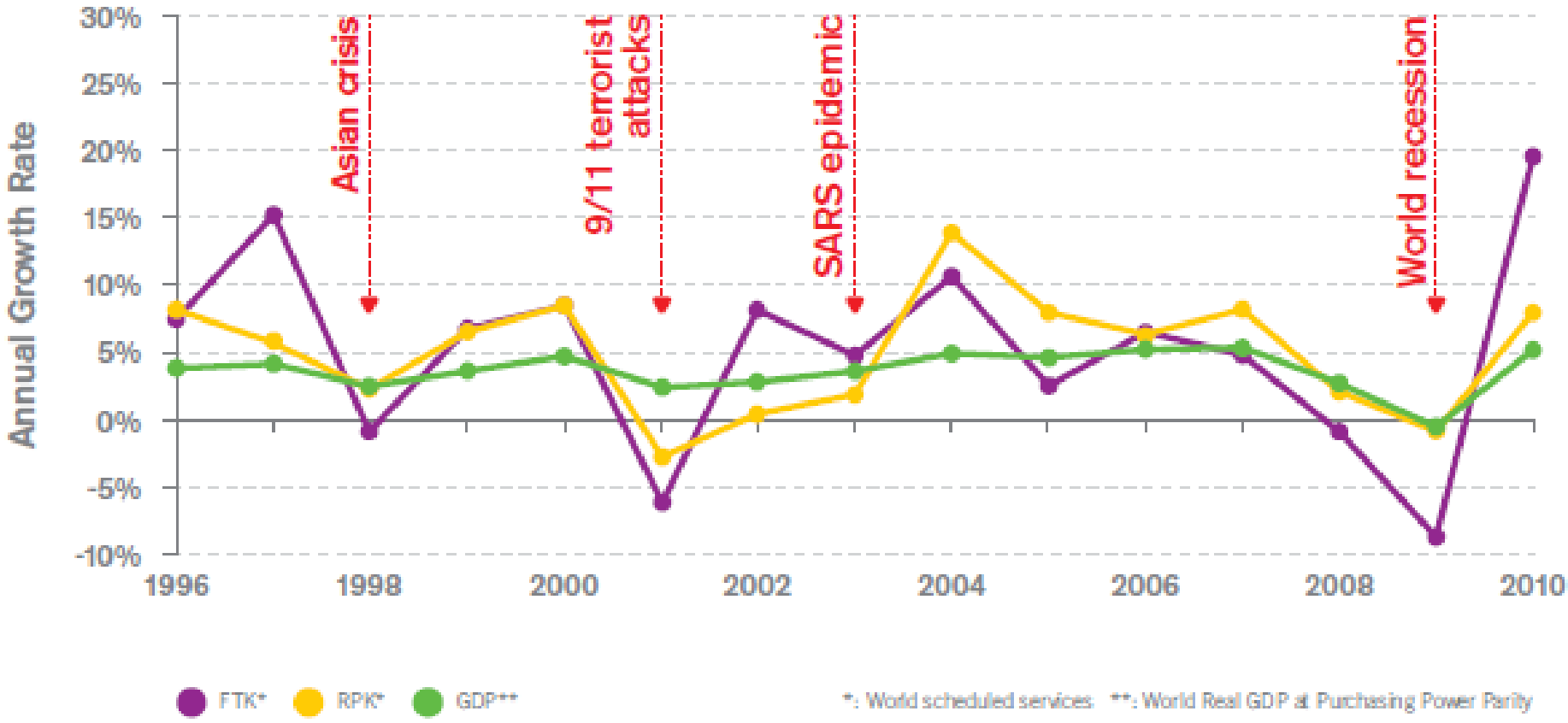
Traffic Statistics for Revenue Schedule Services






World economic growth vs. air traffic growth (passenger and cargo)

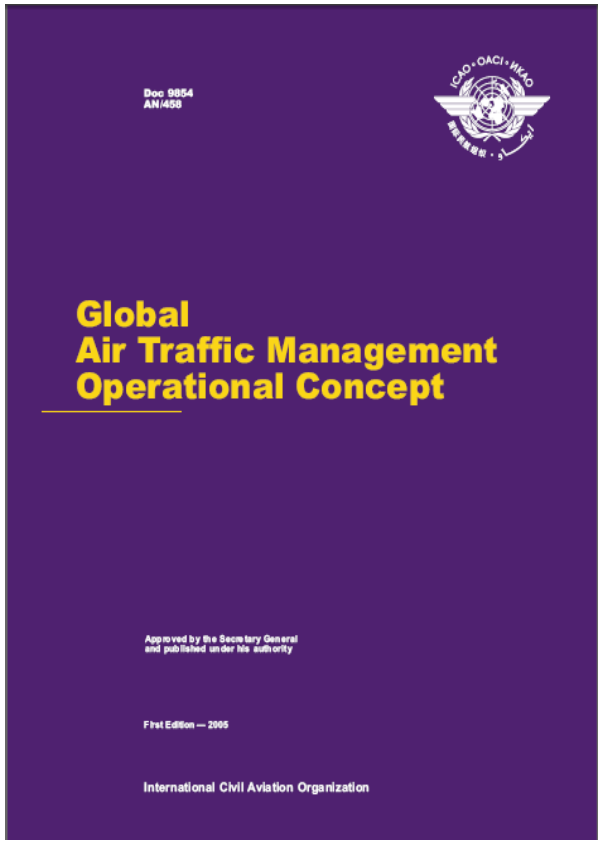
Source: IHS Global Insight, ICAO








ATM Vision



To achieve an interoperable global air traffic management system for all users during all phases of flight, that

- meets agreed levels of safety;
- provides for optimum economic operations;
- **is environmentally sustainable**; and
- meets national security requirements.

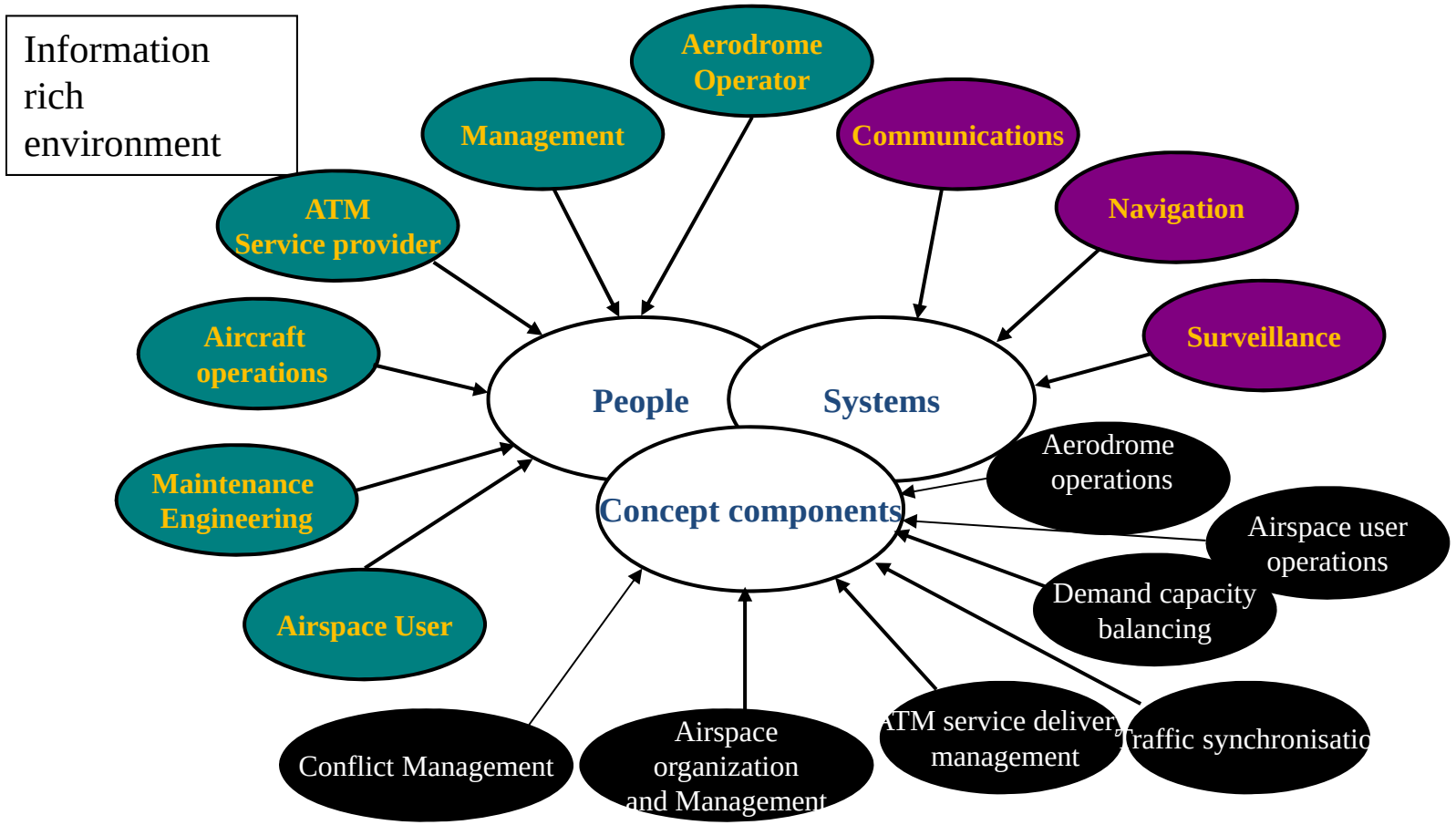
ATM Expectations

- Access and Equity
- Capacity
- Cost-effectiveness
- Efficiency
- **Environment**
- Flexibility
- Global interoperability
- Participation by the ATM community
- Predictability
- Safety
- Security





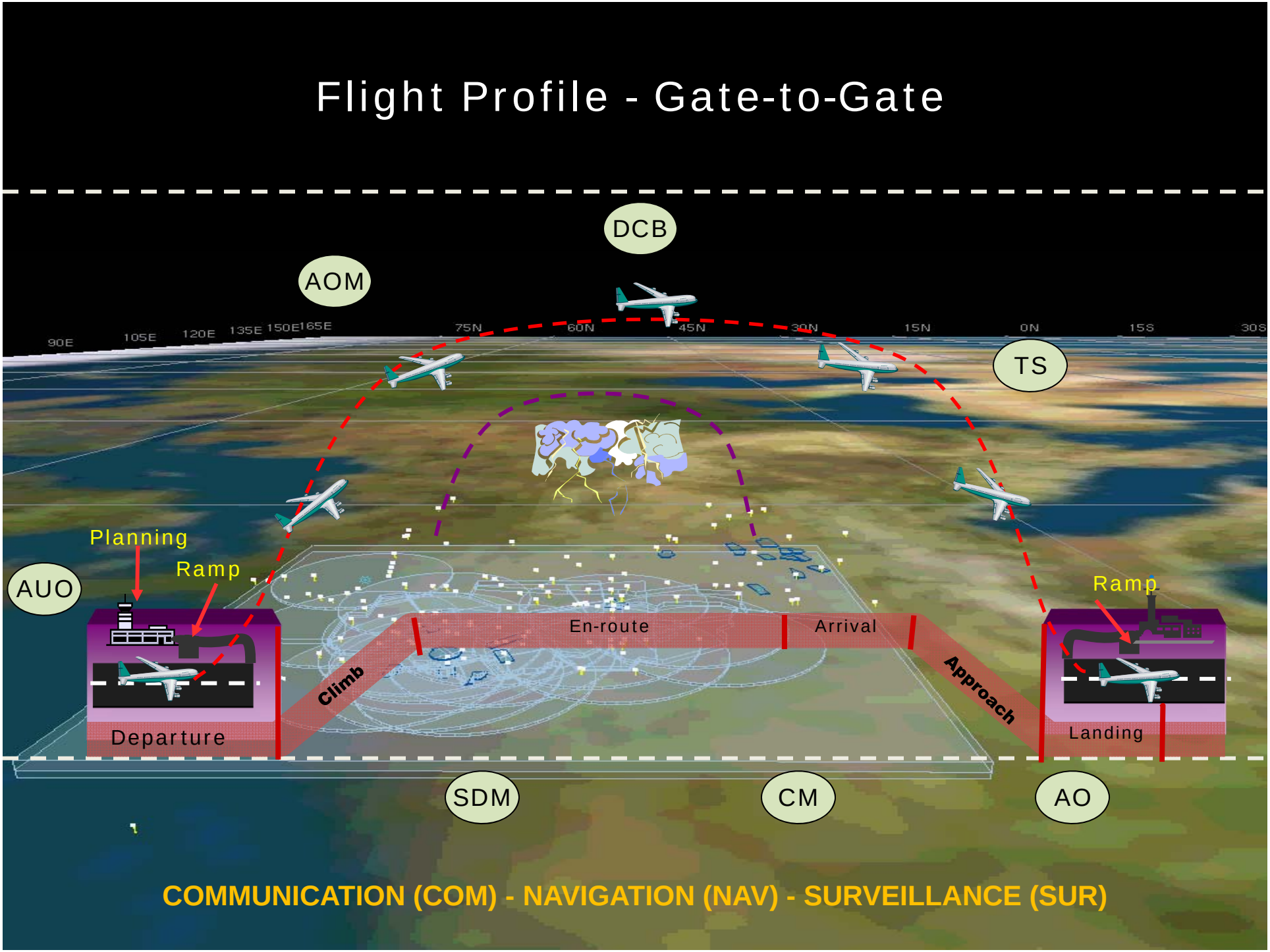

Integration



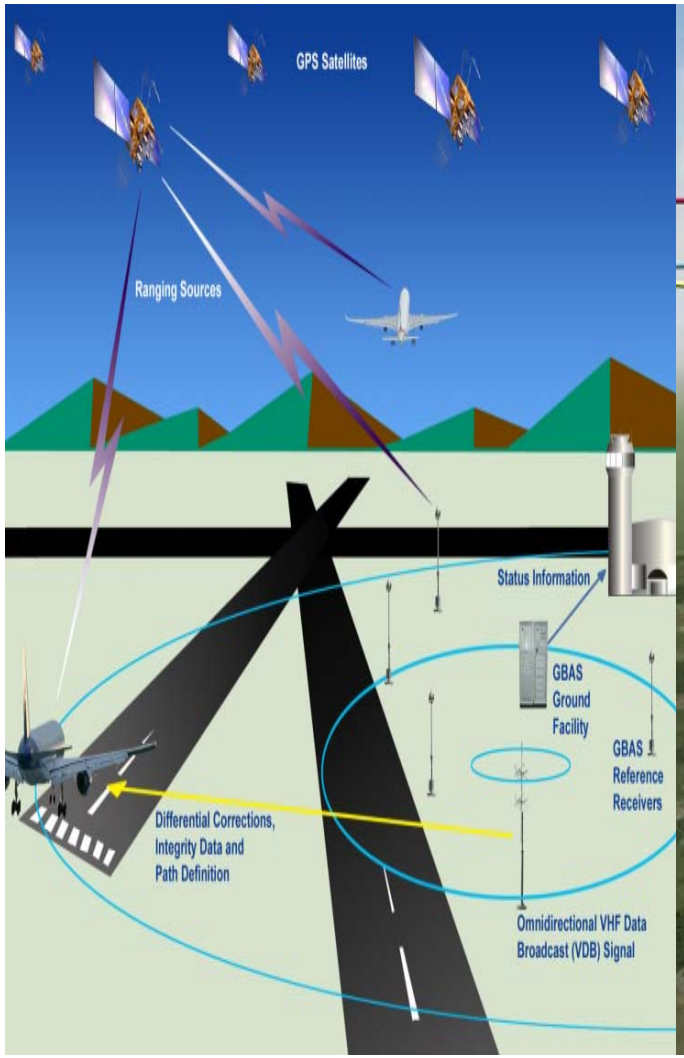


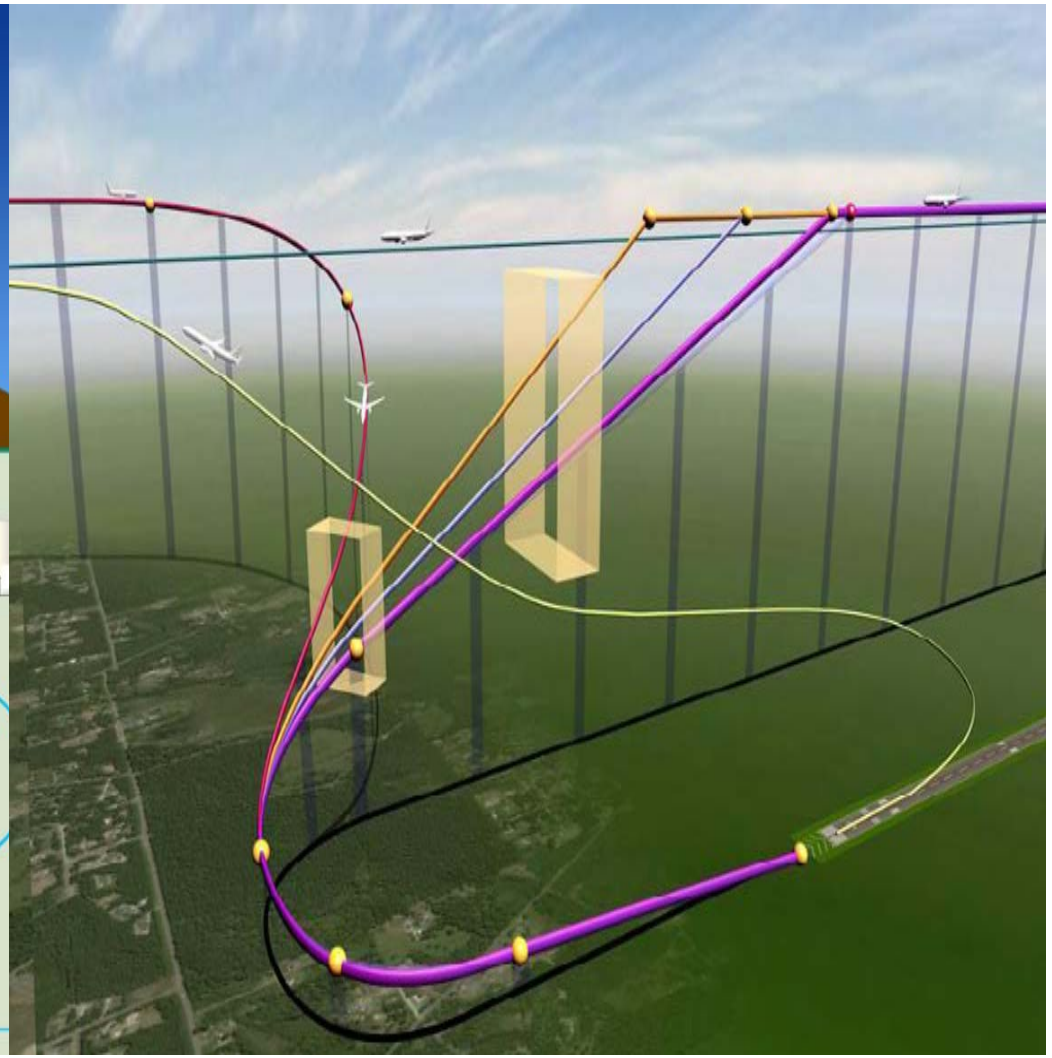



Flight Profile - Gate-to-Gate



PBN implementation







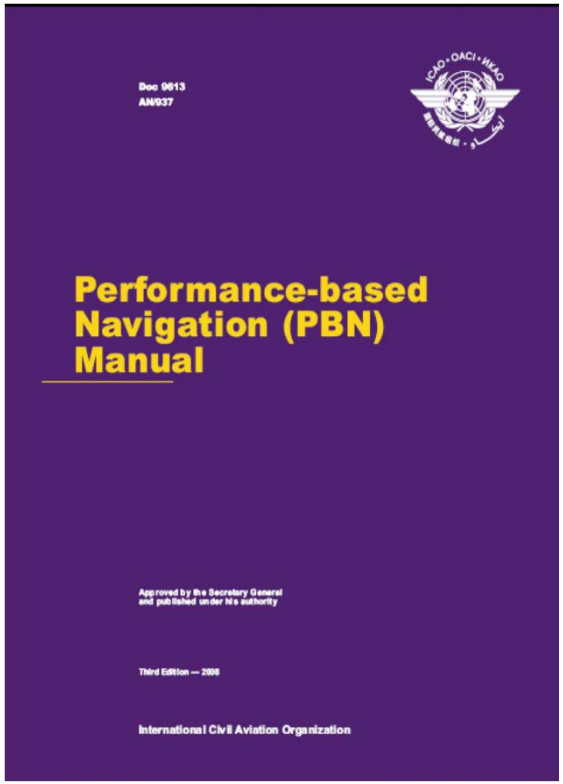
PBN Implementation (2)

- ICAO global vision for air traffic management (ATM)
- ATM Community to find the best way to maximize the efficiency for all the stakeholders
- Maximize the benefits of modern navigation methods






ICAO DOC 9613



- Volume I
  - Part A - The PBN Concept
  - Part B – Implementation Guidance
- Volume II – Implementing RNAV and RNP

- ICAO Doc 8168, PANS-OPS Vol II
- Doc 9906, Vol I, FPD QA System
  - Vol 2, FDP Training
  - Vol 3, FPD Software validation
  - Vol 5, Validation of FPD
  - Vol 6, Flight validation, Pilot Training and evaluation
- Doc 9905, RNP AR Procedure Design Manual
- Doc 9992, PBN in Airspace Design
- Doc 9933, CCO Manual
- Doc 9931, CDO Manual

PBN Airspace Concept

Communication

Navigation

Surveillance

CNS

Air
Traffic
Management

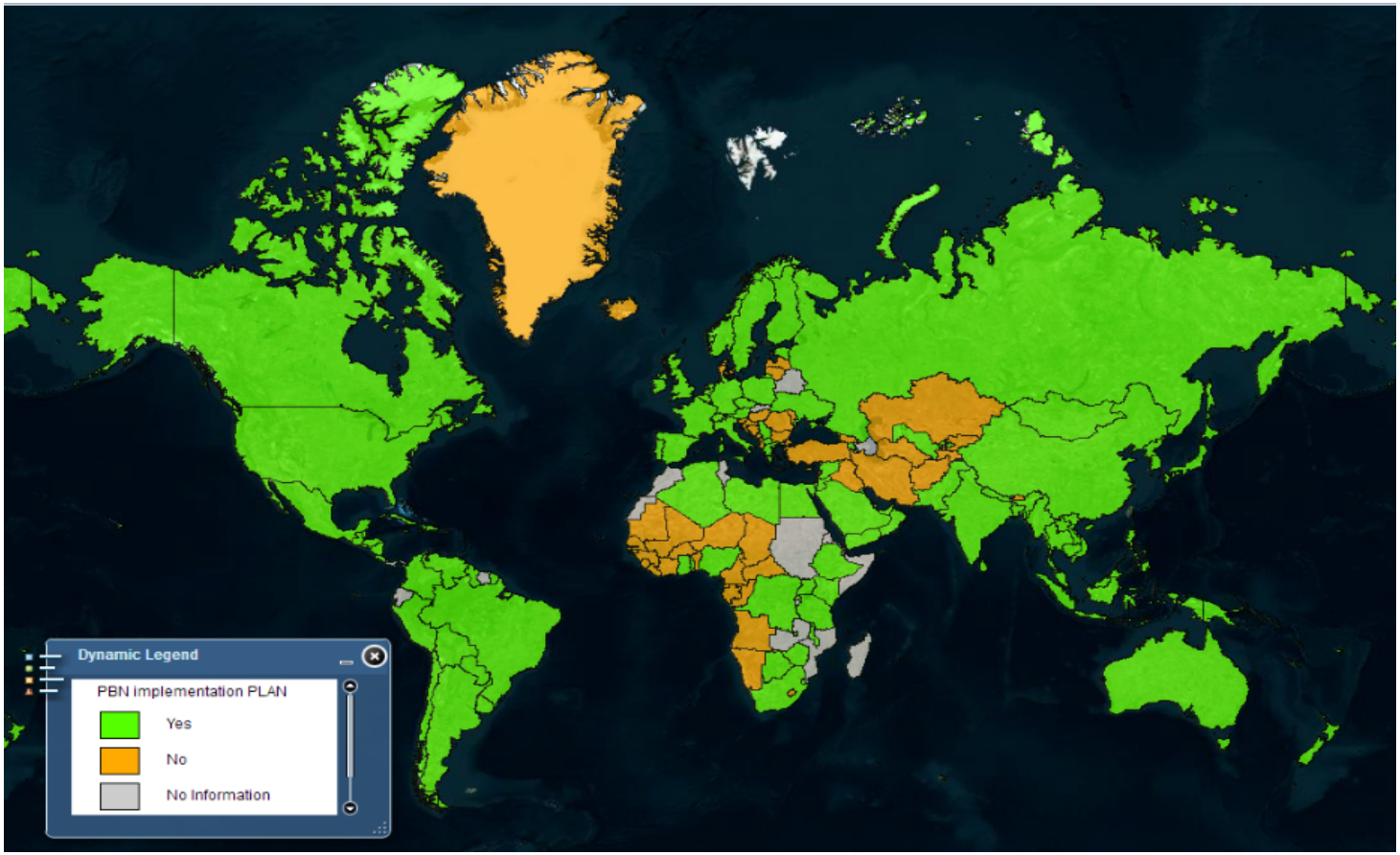
- Regulations
- Procedures
- Training
- Service Provider
- Human Factors






PBN Implementation Programme

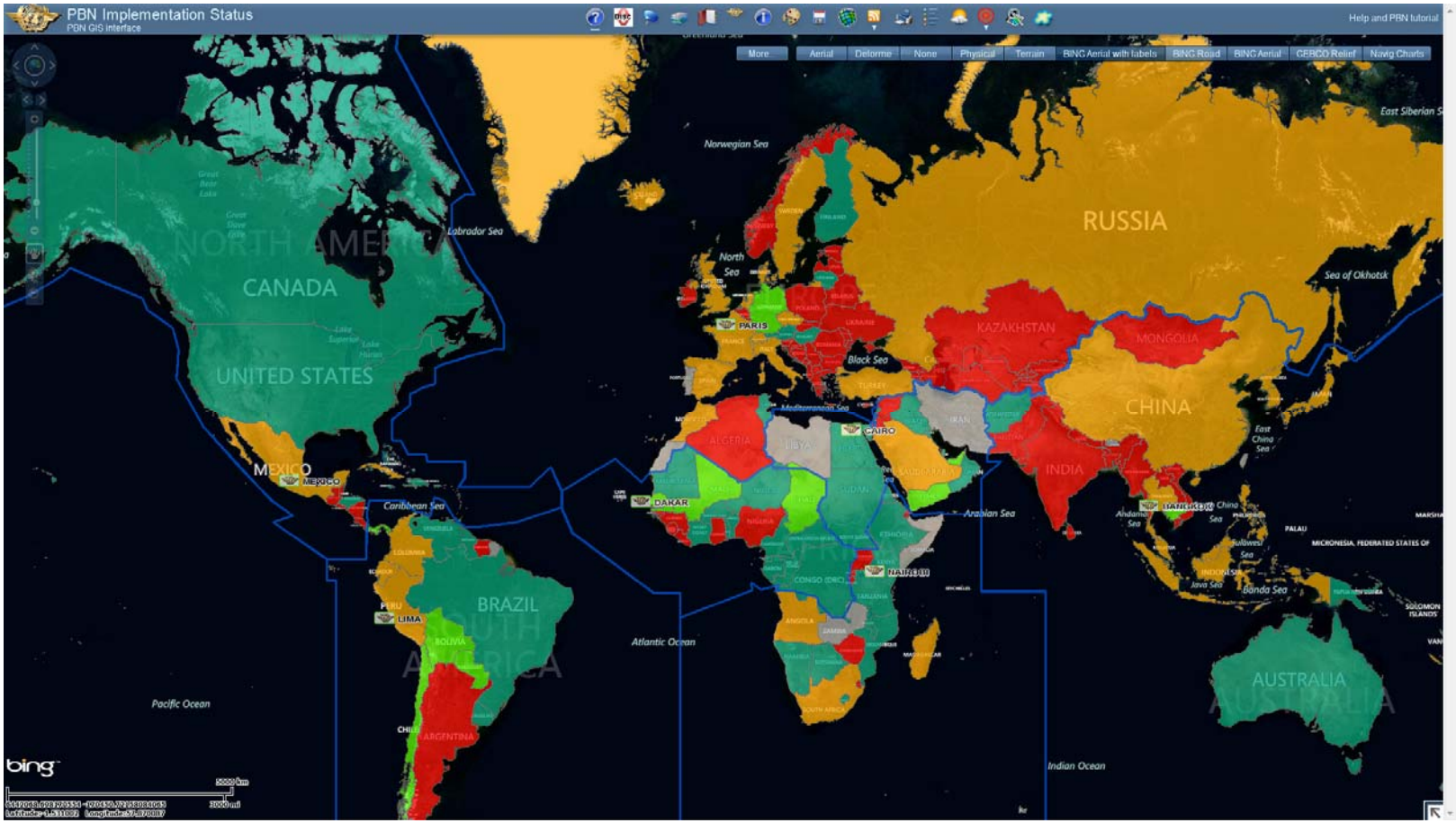
58% of States have PBN Implementation Plan







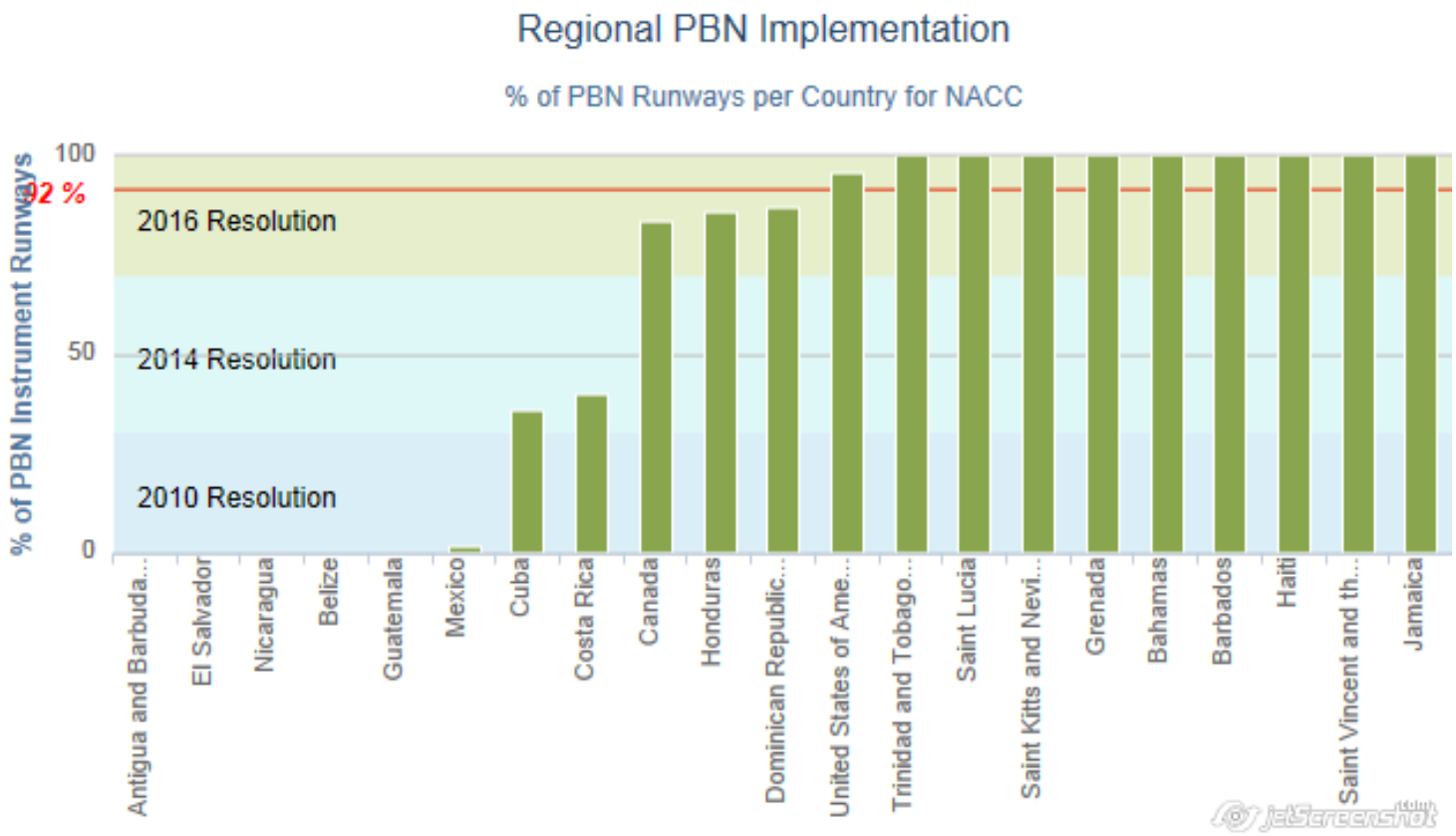

PBN approaches





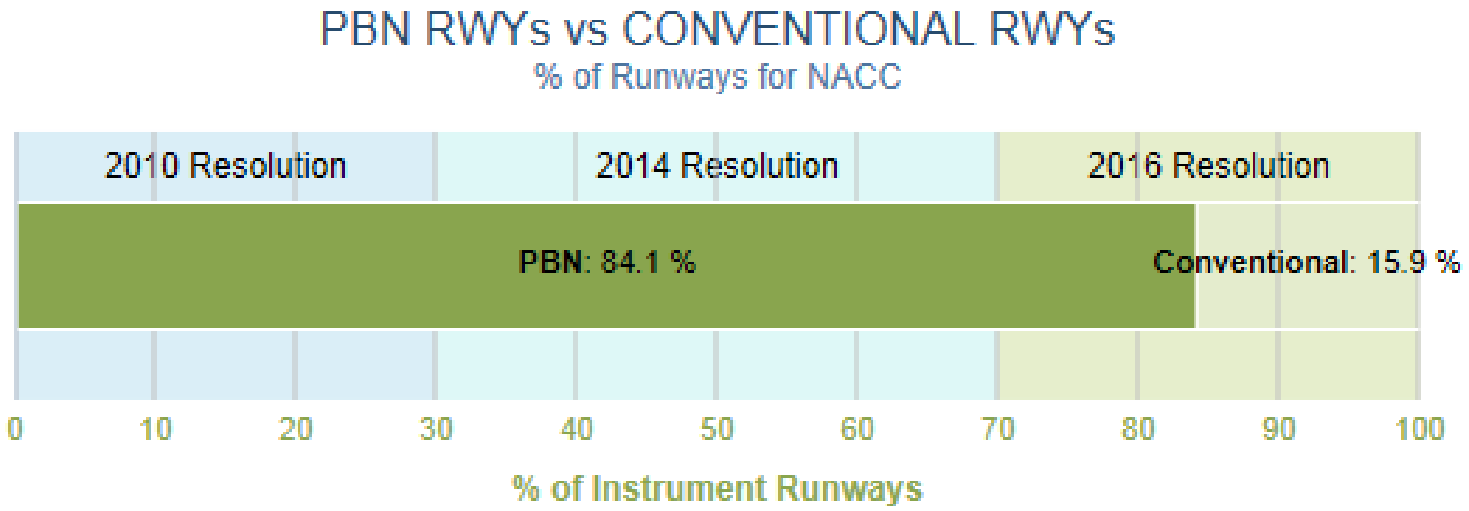



Assembly Resolution A37-11

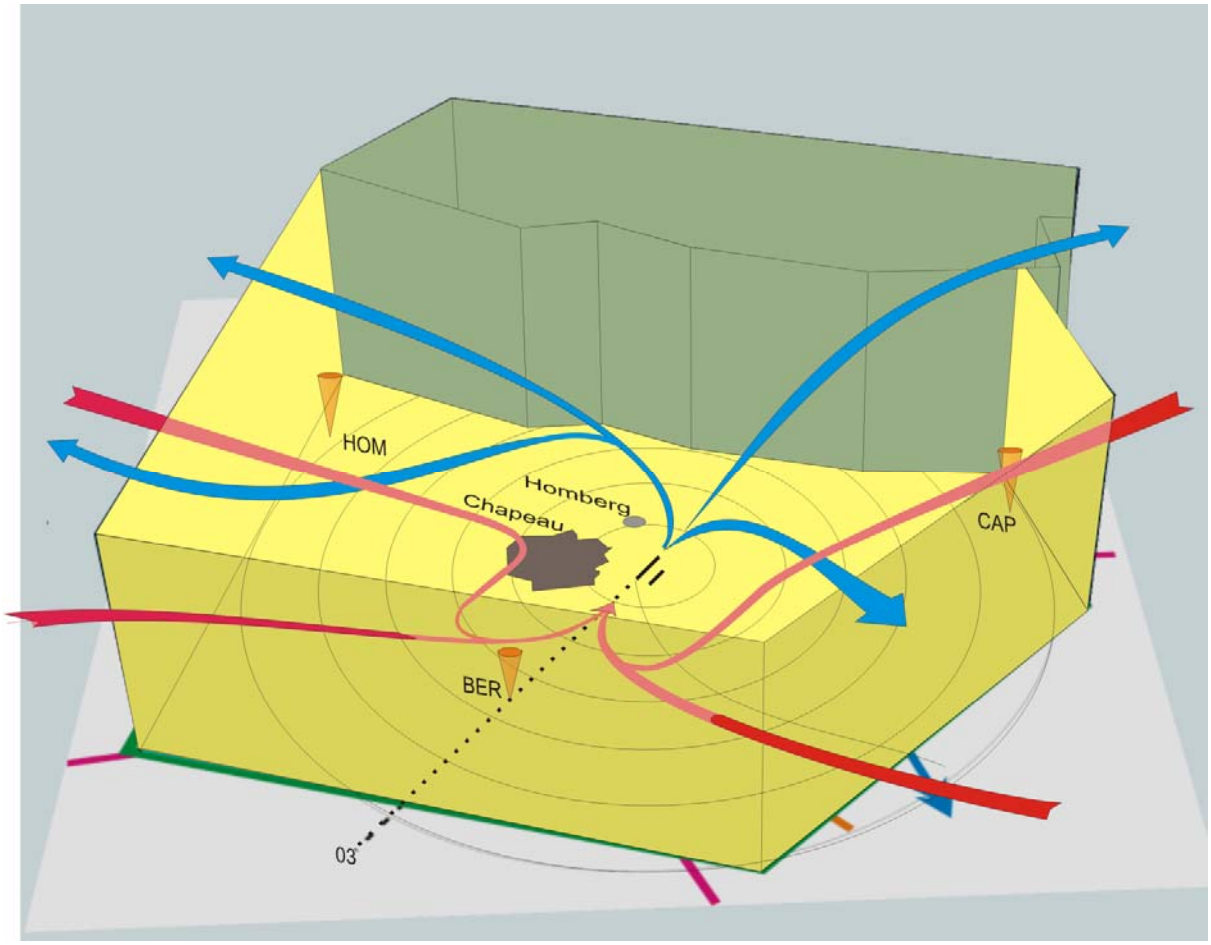


Source: ICAO SPACE

PBN achievements



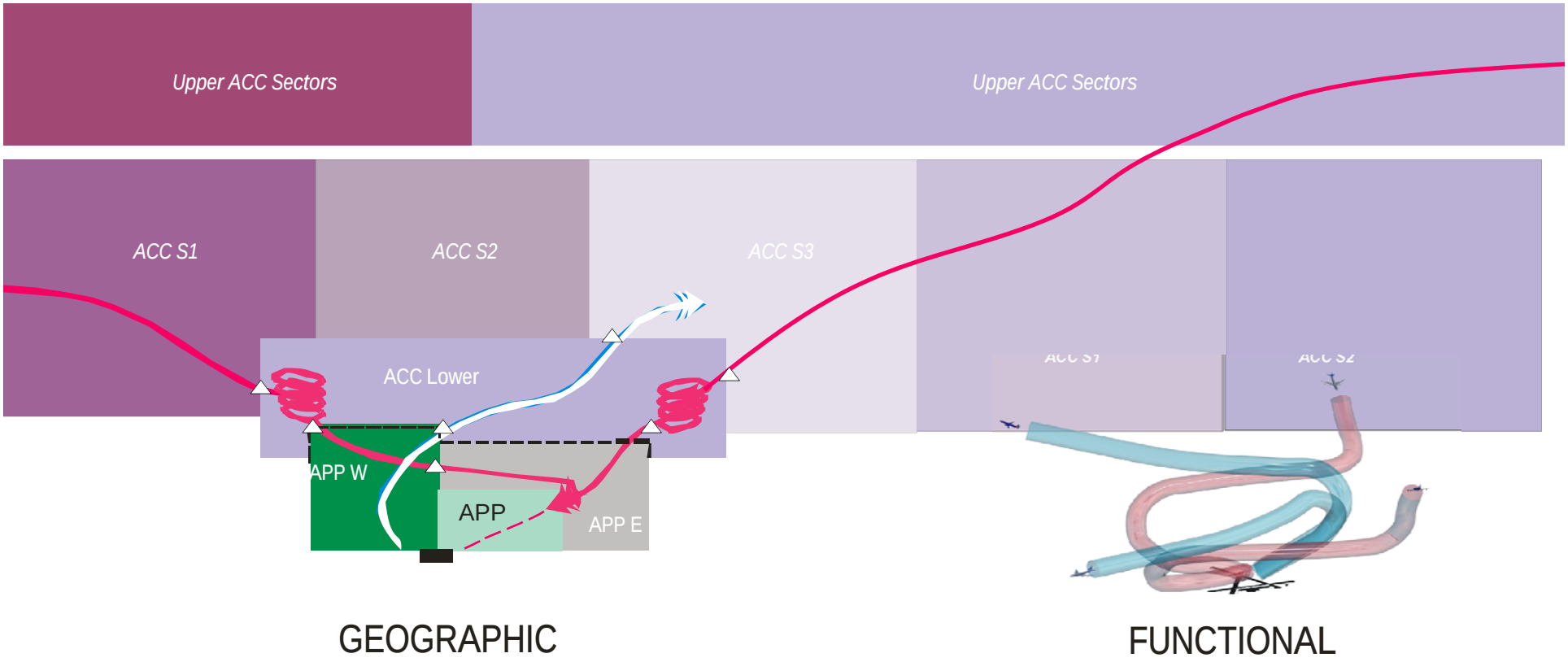
What's next?



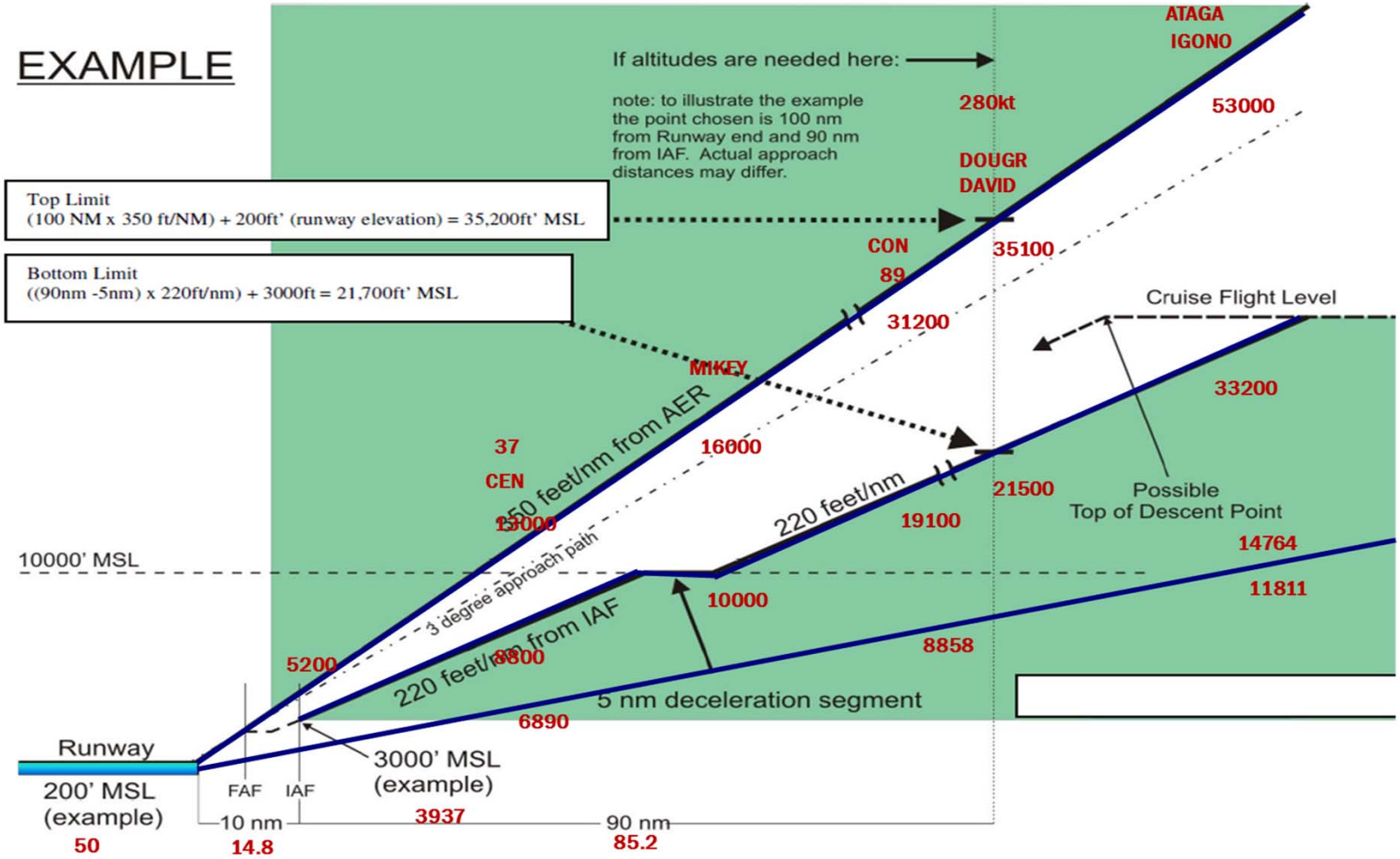





Airspace Redesign / ATC Sectorization



Continuous Descent Operations (CDO)





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PBN Implementation Benefits

- Fully Managed Approaches
- Better descent profile
- Stable configuration
- Route Predictability

- Less…
- … Diversions
- … cancellations
- … fuel burn

- Reduce CO2 emissions
- Avoid Noise Sensitive Areas

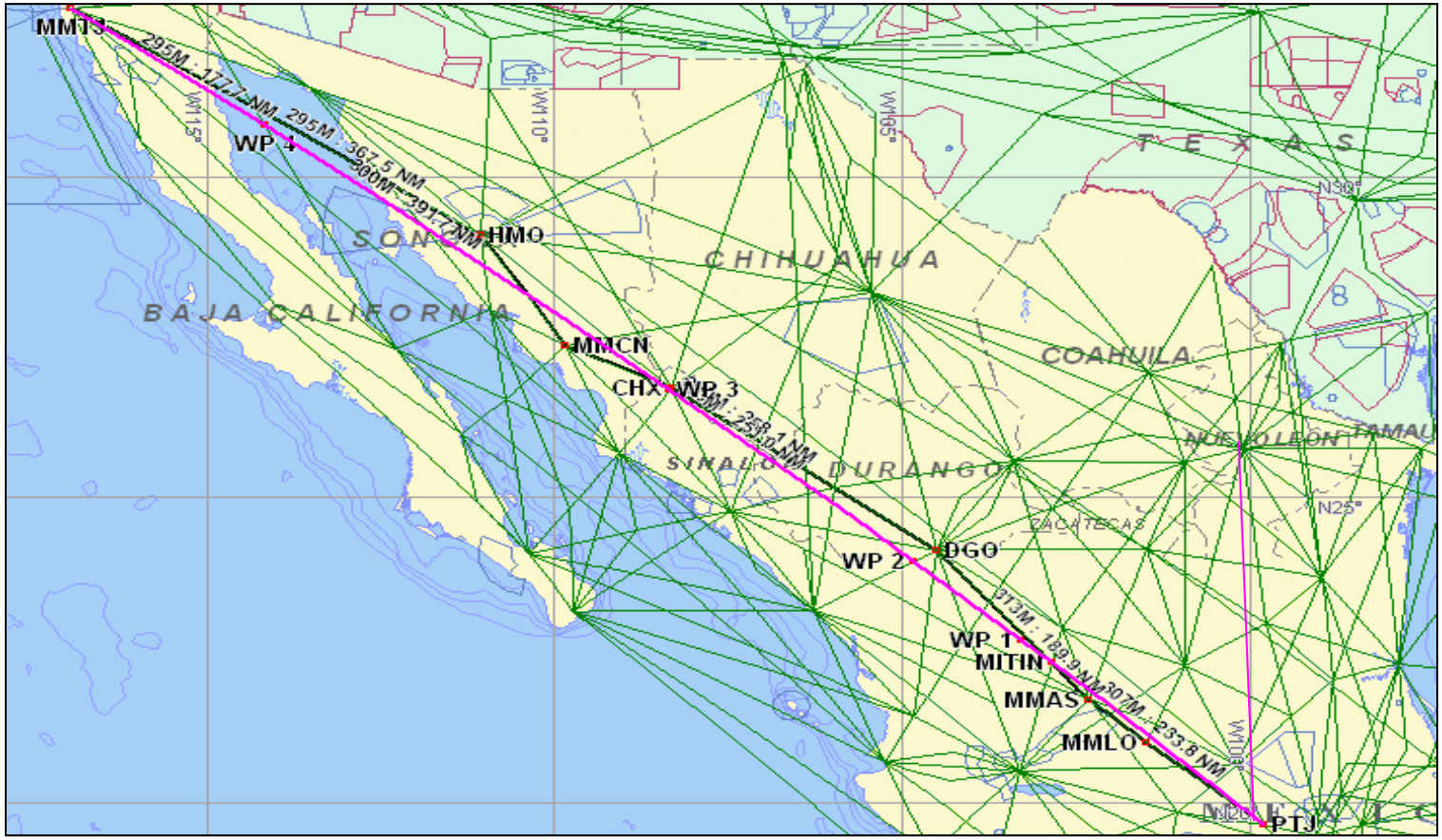





PBN savings

MMTC - MMTJ

NAV Route:	1215 NM
RNAV Route:	1202 NM
SAVINGS:	13 NM








PBN performance metrics

ROUTE	NAV	DISTANCE		TIME	FUEL
		GROUND	AIR		
TLC-TIJ	CONV	1,330	1,435	03:17	9,010
	PBN - RNAV	**1,261**	**1,378**	**03:09**	**8,440**
MTY-TLC	CONV	467	455	01:08	3,040
	PBN - RNAV	**433**	**425**	**01:04**	**3,010**

Monthly Savings	Jan	Feb	Mar	Abr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kg	47,857	45,437	52,987	51,230	55,831	54,030	143,127	143,127	117,360	121,272	117,360	143,127
Min	1,196	1,136	1,325	1,281	1,396	1,351	3,578	3,578	2,943	3,032	2,934	3,578

1 gl = 1 Kg CO2

1 lt. = 3.157 kg. -CO2

1 Ton = 3.157 Tons CO2

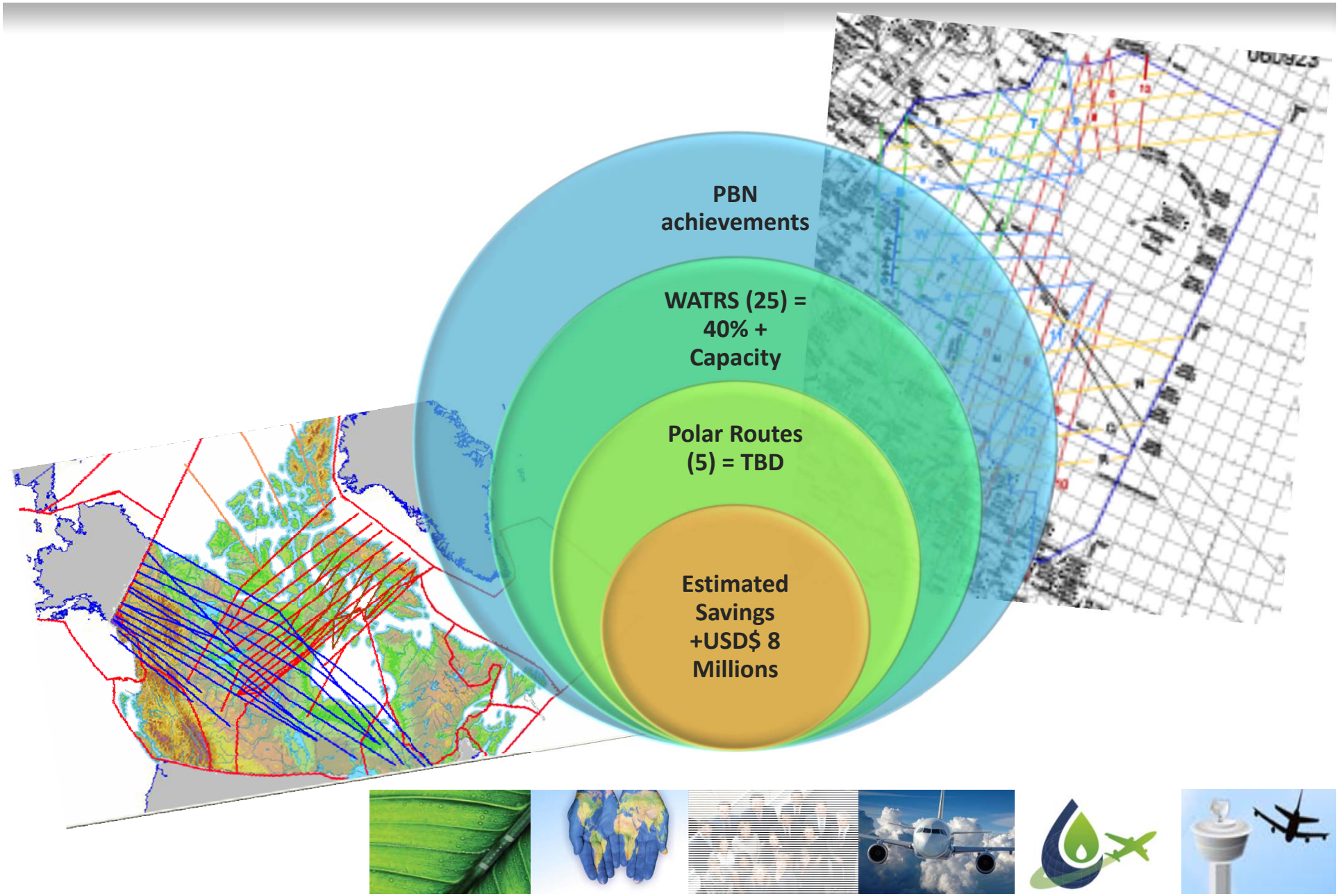
Fuel: 1,000 Tons.
CO2: 3,140 Tons.

Ref: Interjet / Volaris

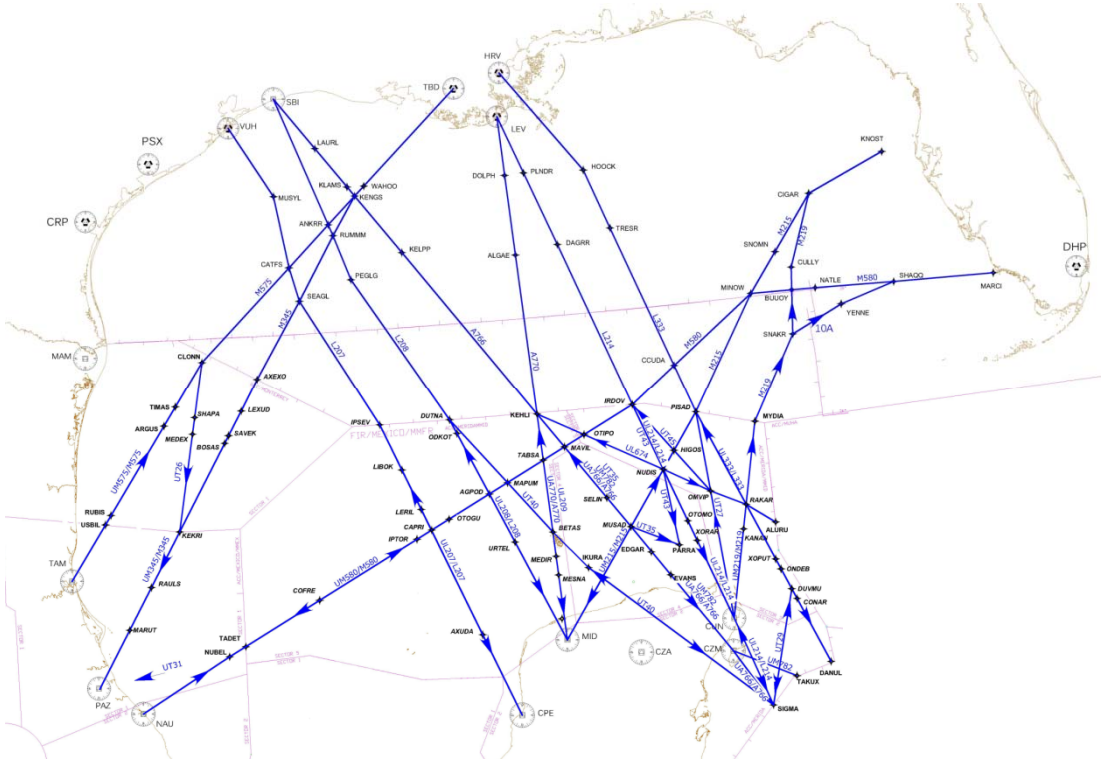





Performance Metrics



Fuel Savings with PBN



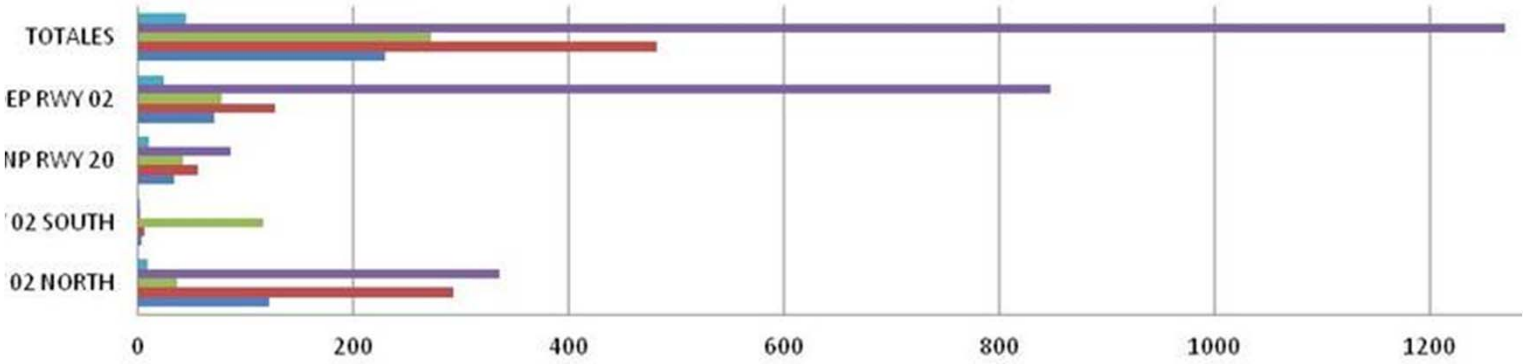
Gulf of Mexico for a 31-day period in 2011 on the new route structure estimated a $1.5M operator fuel cost savings






PBN use

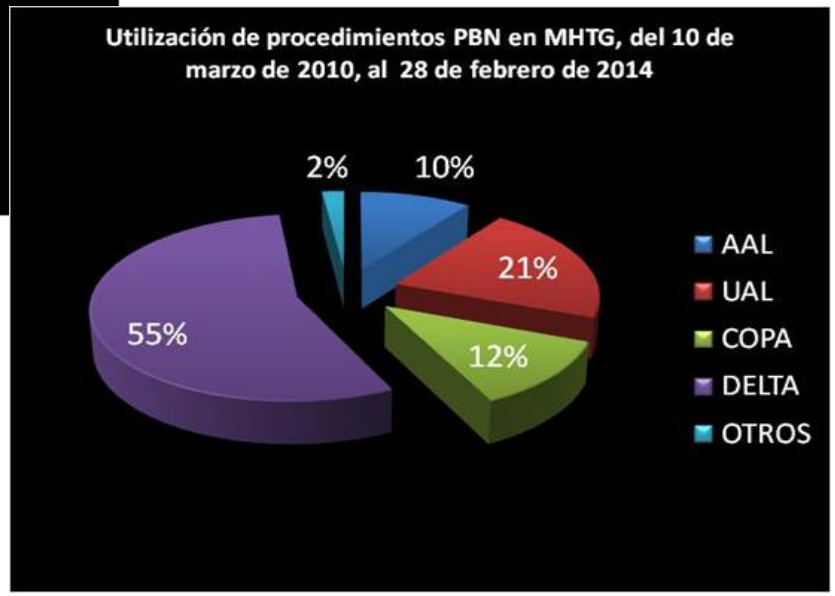
Utilización de procedimiento PBN en MHTG, del 10 de marzo de 2010, al 28 de febrero de 2014



NAV RNP RWY 02 NORTH	RNAV RNP RWY 02 SOUTH	RNAV RNP RWY 20	RNAV DEP RWY 02	TOTAL
9	2	10	24	45
335	1	86	847	1269
36	116	42	78	272
293	6	56	127	482
122	3	33	71	229

PBN use


Utilización de procedimiento PBN en MHTG, del 10 de marzo de 2010, al 28 de febrero de 2014
2500
2000
1500
1000
500
0
229
482
272
1269
45
2297
AAL
UAL
COPA
DELTA
OTROS
TOTAL
Operaciones


Utilización de procedimientos PBN en MHTG, del 10 de marzo de 2010, al 28 de febrero de 2014
2%
10%
21%
12%
55%
AAL
UAL
COPA
DELTA
OTROS

DRAFT CONCLUSION NACC/WG/4/3

FUEL SAVINGS AND CO_2 GAS EMISSIONS RESULTS IN THE NAM AND CAR REGIONS

That, considering the importance of obtaining effective information on the consumption of fuel, IATA

a) coordinate with Canada, Dominican Republic, Mexico and United States regarding effective information of fuel savings resulted from the use implementation of RNAV routes as well as PBN approach procedures at peak hour in 10% of airports with largest number of operations in States, as applicable; and

b) provide the ICAO NACC Regional Office not later than **31 December 2014**, the effective information on fuel savings and reduction of CO2 gas emissions obtained from the implementation of PBN routes and approach procedures in the NAM and CAR Regions.

States Challenges

- Develop PBN training programmes for all staff concerned (Civil Aviation Authority (CAA), ATS, airlines, etc.)
- Develop and implement PBN operational approval processes and recognize other State's PBN operational approval as described in the ICAO Doc 9613, PBN Manual
- Review ATS Letters of Agreement among adjacent ATC units With the implementation of continuous descent operations (CDO)
- ensure the high quality of the aeronautical information and data associated to the publication of PBN aeronautical charts.
- review their navigation infrastructure (DME/DME, VOR, etc.) coverage for PBN implementation in the terminal areas.
- revise restricted areas based on the Flexible Use of Airspace (FUA)



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