PBN & ATFM

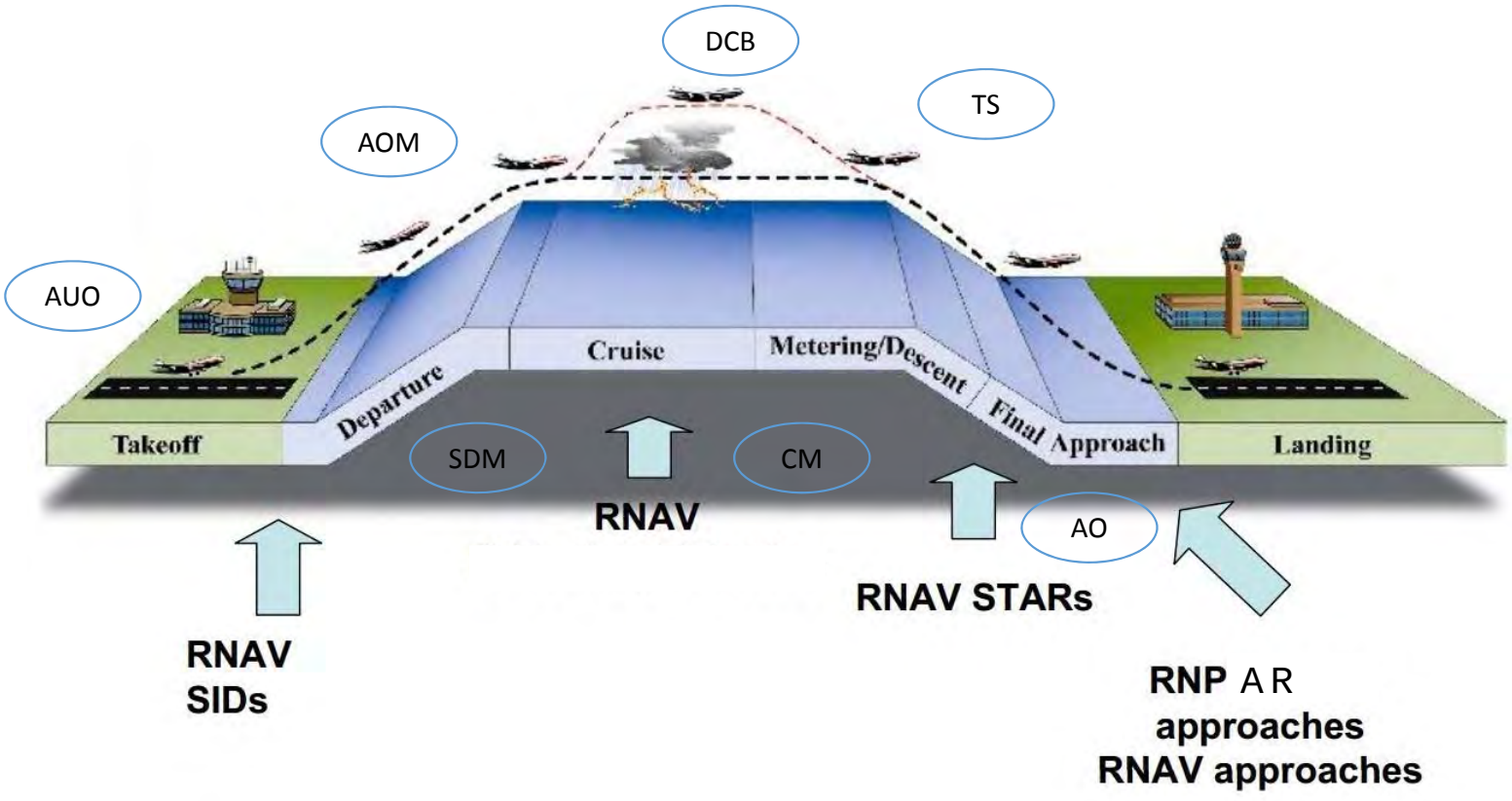
Hand in Hand

ICAO Workshop on Regional Implementation PBN Airspace Redesign
May 4 – 8, 2015
Mexico City, Mexico

Objectives

- Briefly discuss Gate to Gate Concept
- Show the connection between PBN and ATFM
- Discuss 4D- Time Based Operations

Gate to Gate concept



Performance Based Navigation - PBN

General Concept

- Enables an aircraft to fly the most efficient lateral/vertical flight path
  - ✓Improvement in safety through on-board monitoring and performance alerting
  - ✓Increase in capacity in controlled airspace
  - ✓Predictable and repeatable path trajectories
  - ✓Environmental sustainability

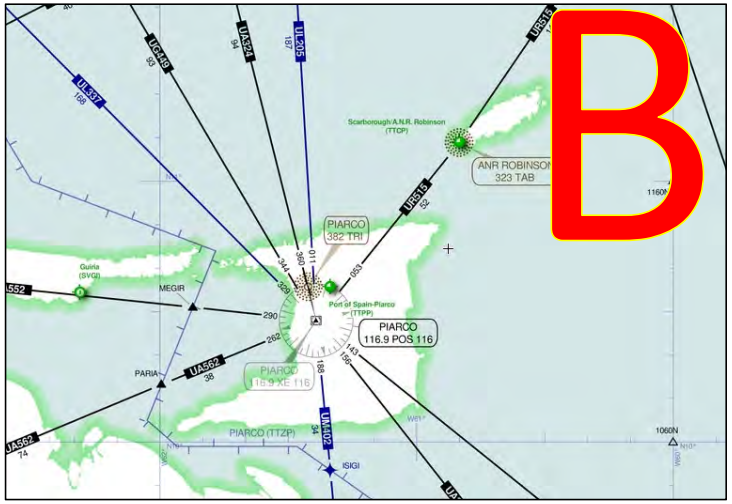
ATFM

- ATFM is a function of air traffic management (ATM)
- The purpose of ATFM is to balance air traffic demand with airspace and/or airport capacity
- Enables the most efficient use of airspace by all aircraft, providing economic, efficiency, environmental and safety benefits for all users of the system
- Common Traffic Management Initiatives(TMIs):
  - Re-routing of traffic;
  - Alternate flight profiles;
  - Minutes-in-trail assignments;
  - Mile-in-trail assignments;
  - Airborne holding; and
  - Ground holding

Airspace Concept Re-design

Current Terminal Airspace

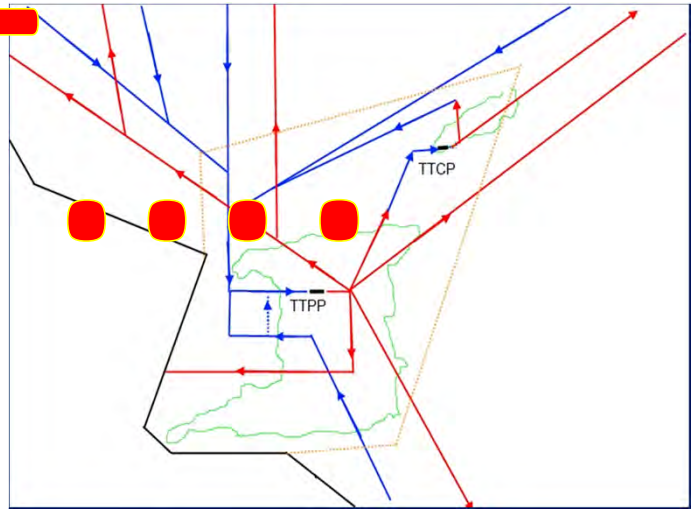
All routes lead to VOR
Choke point over NDP for Approaches
NAVAID CENTRIC



BUT....

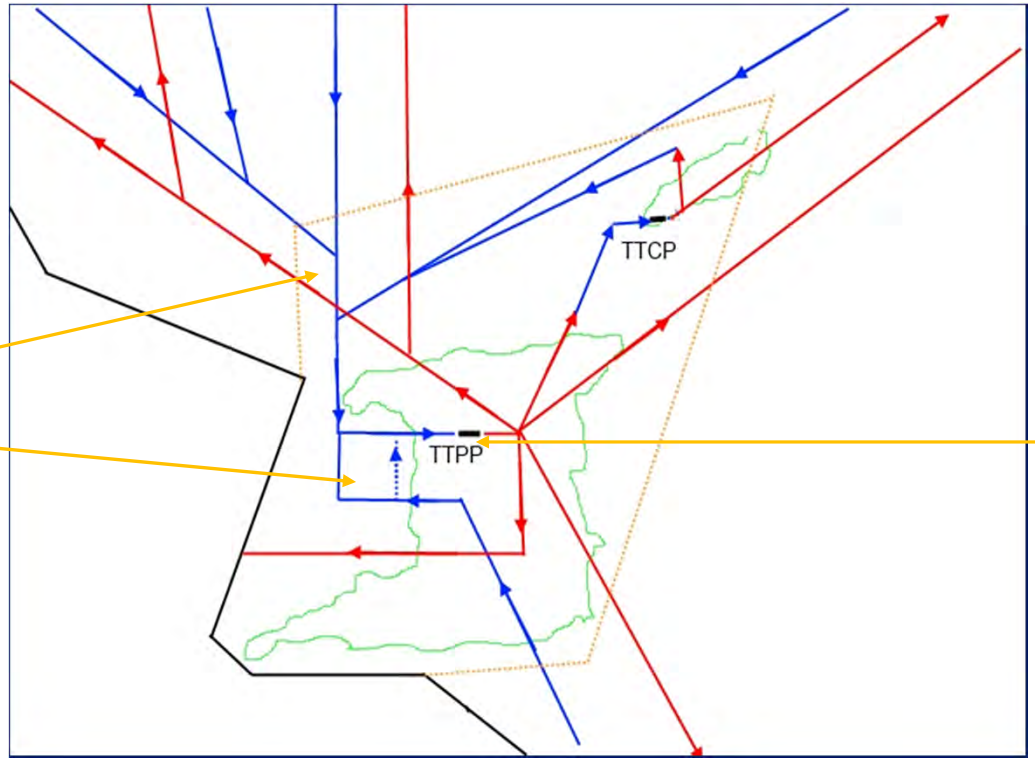
Conceptual Re-design

Routes re-structured
SID & STARs Implemented
CDOs and CCOs facilitated
TMA size reduced



Without some type of strategic traffic plan

ACFT arrive at arrival fixes at same time and have to hold or be vectored



ACFT start up at the same time and still have to wait for departure

Non-integration of ATFM with PBN implementation

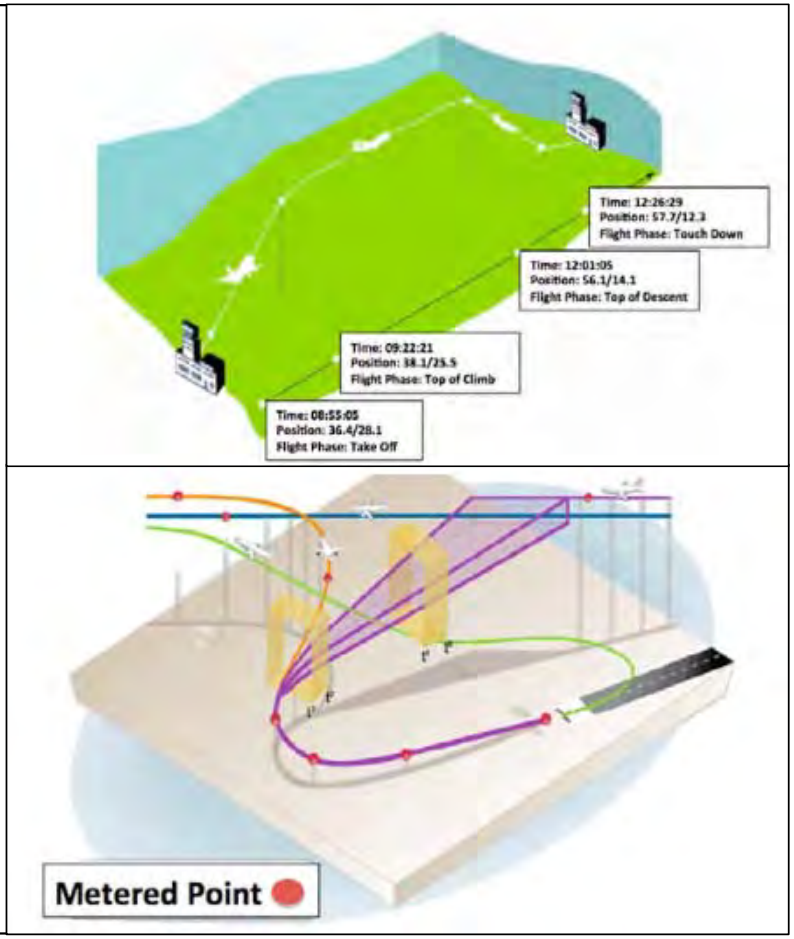
- Current PBN and ATFM technologies provide specific benefits independently
- Inherent issues when ATFM and PBN are implemented in silos:
  - ATFM
    - Choke points in airspace structure require tactical measures by ATC
    - Airline Scheduling causes imbalance in DCB
  - PBN
    - When system becomes saturated tactical vectoring/Holding still required
    - CNS or equipage failure reduces capacity and results in possible overload to system

Integration of ATFM and PBN

- PBN provides greater efficiency and effective capacity by utilizing less airspace and enabling higher traffic throughput in constrained airspace.
- ATFM balances overall capacity and demand, integrates and synchronizes all phases of flight
- Airspace Capacity gains through PBN are maximised by ATFM

Integration of ATFM and PBN

- Move from “distance – based” ATC system to “Time - based”
- Through CDM DATA collected from:
  - o ANSP
  - o ACFT Operator Flight Planning System
  - o FMS
- ATM Tool analyses data and predicts trajectories
- ACFT can be given specific time to arrive at fixes (RTA) (AMAN)
- Planning the departure sequence will allow more departures to execute the RNAV departure procedures (DMAN)



4D - Time Based Operations (TBO)

- Applicable to all phases of flight
- Integrated ATM system
- Before and throughout the flight, the aircraft's trajectory information containing current and predicted positions will be exchanged with all concerned Air Navigation Service Providers
- Through CDM, RTAs will be provided for each flight at congested airway points or aerodromes
- Weather data and information on airspace/aerodrome closures continuously available so that best routing options are utilized

Challenges with implementing Full 4D TM

- Technology – Automation, Integration, ACFT equipage, Data- link, SWIM
- Human Factors – ATCOs need to understand how clearances impact on the trajectory of the ACFT and Pilots have to be disciplined in accepting RTAs
- Contingencies - Due to equipment failure at any point in the chain

Benefits of TBO

- Improvement of air traffic operations by increasing the overall predictability of traffic;
- Optimal operations for airlines (aircraft using preferred routes and levels);
- Better service provided (due to ground-ground and air-ground interoperability) – fewer trajectory distortions;
- Reduced costs (e.g. fuel and/or time);
- Reduced emissions;
- Increased capacities (en-route and airport) – controllers would be able to handle safely more traffic;
- Easier to handle traffic for the controllers (fewer conflicts, information comes well in advance);

Thank You for your attention