

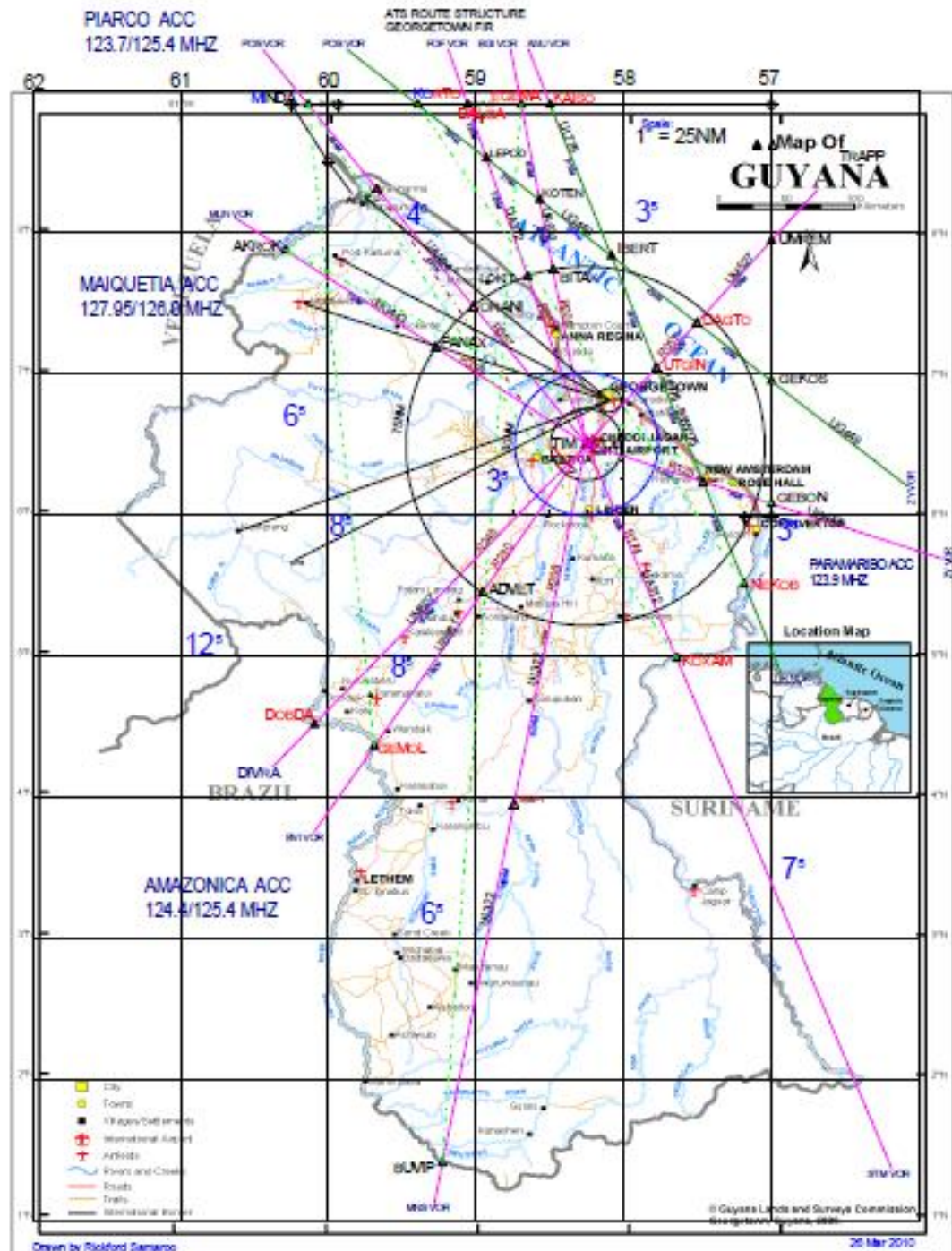


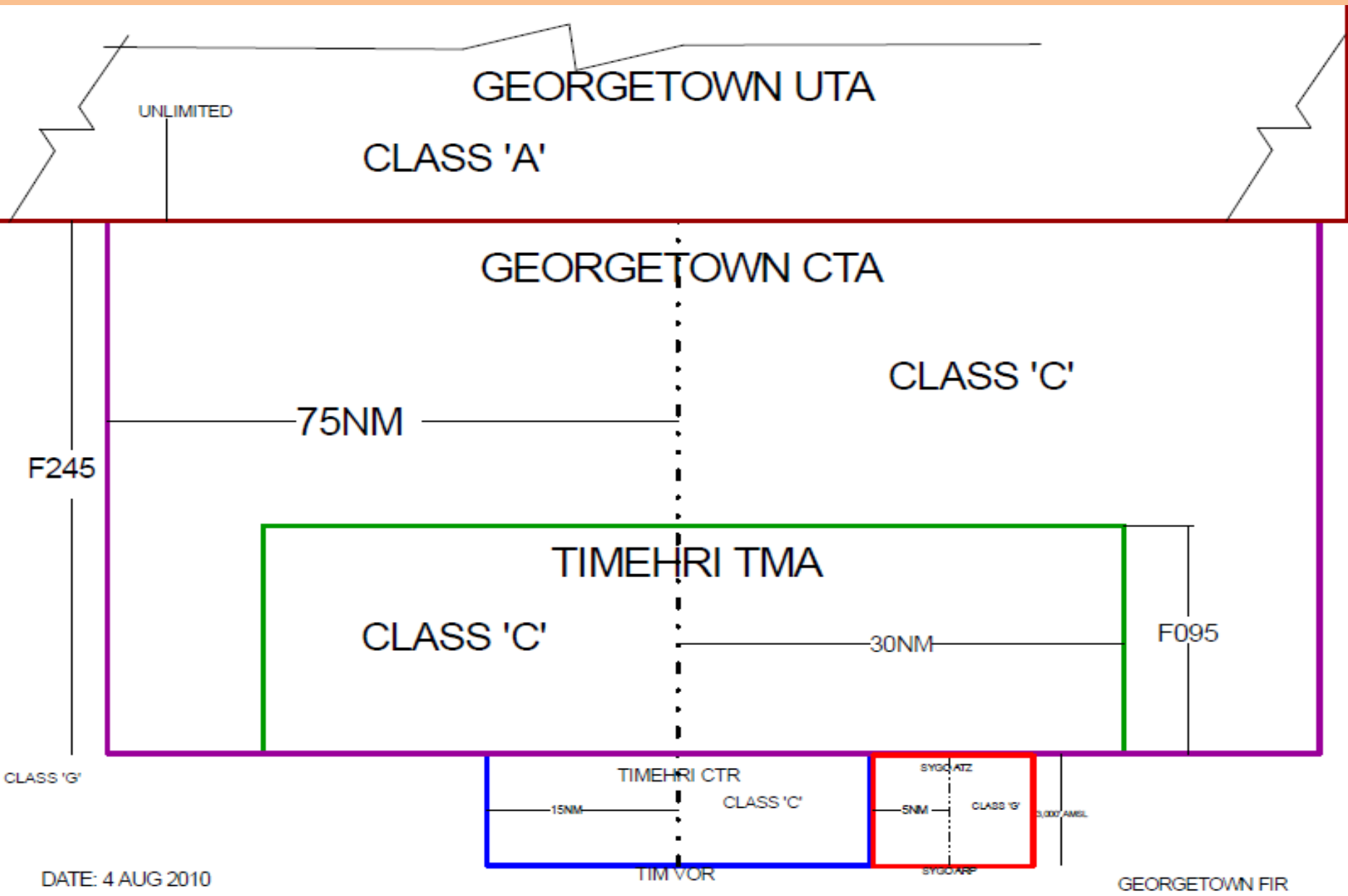
GUYANA AIRSPACE CONCEPT PBN WORKSHOP 9-13 MAR. 2015

PRESENTED BY
RICKFORD SAMAROO
MANAGER ATS.

OVERVIEW

- GUYANA - GEORGETOWN FIR (SYGC)
- AIRSPACE
- CNS/ATM
- Reference scenario (present)

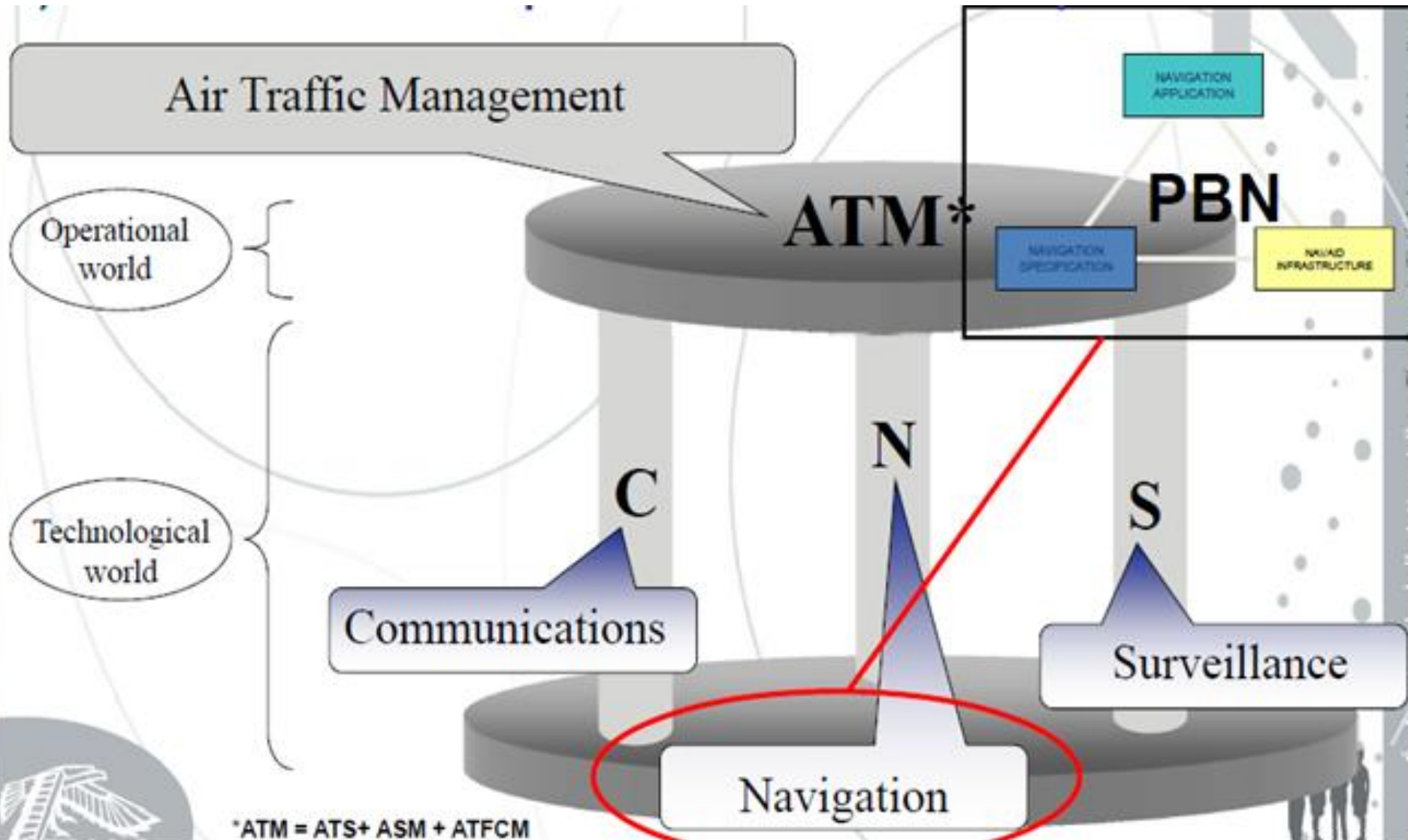




DATE: 4 AUG 2010

GEORGETOWN FIR

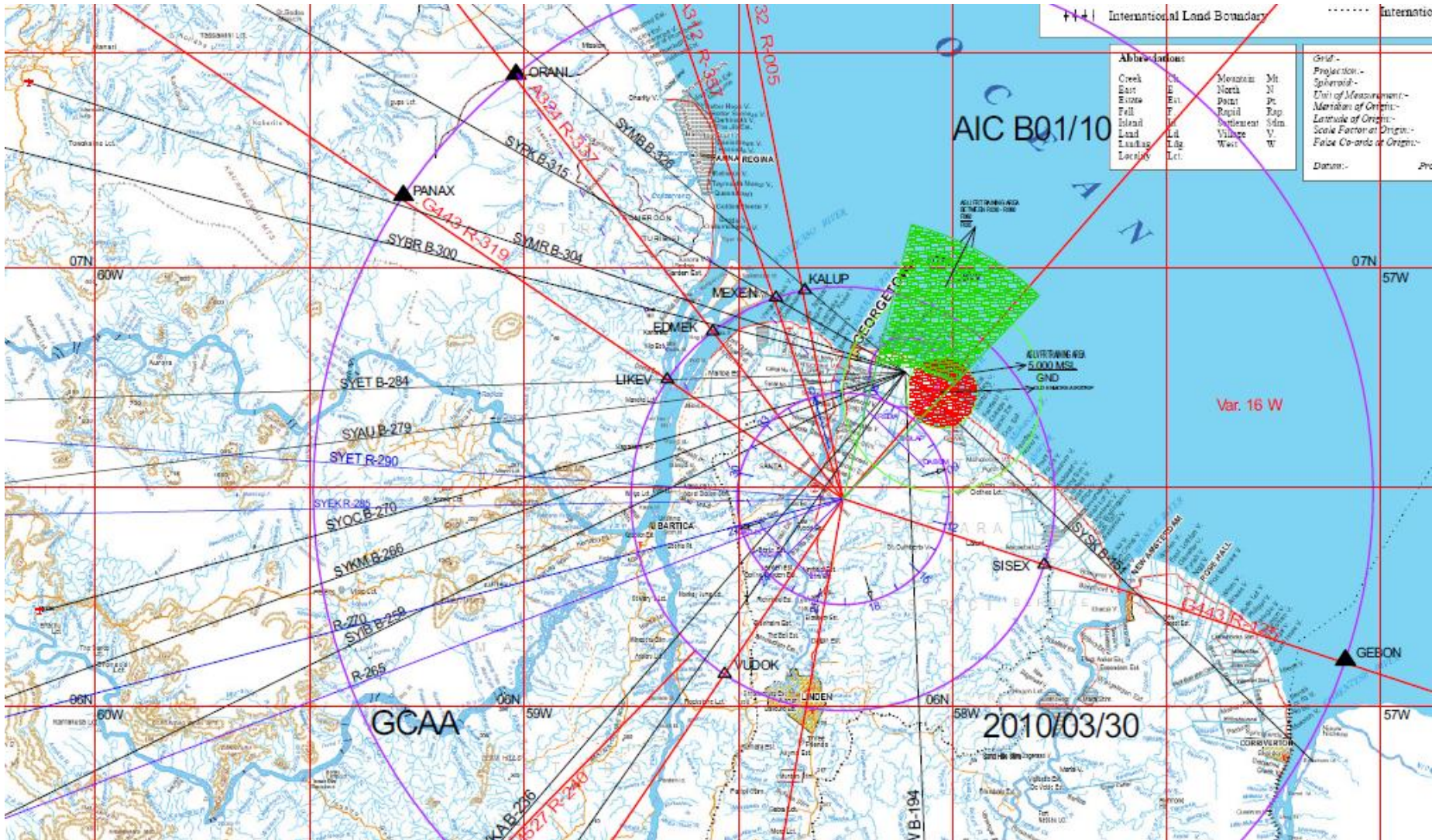
CNS/ATM



CNS/ATM

- COMS- VHF AND HF
- NAV. - 1 VOR AND DME STATION AT SYCJ AIRPORT and use of GNSS - AIC
- SURV. – ADS-B ON TRIALS.
- Plan implementation last quarter 2015 in SYGC UIR.
- ATM – SKYCONTROL SYSTEM FROM INTEL CAN.

Present airspace layout



CHALLENGES

- VERY HIGH LEVEL OF TACTICAL CONTROL
- NO PREDICTABILITY
- NO SID/STAR
- ISSUES WITH;
 - EFFICIENCY
 - SAFETY
 - ENVIRONMENT
 - CAPACITY

Why develop an Airspace Concept?

- ✈ The development of an Airspace Concept provides a structured and systematic way of determining
 - **What** is to be achieved in an airspace, and
 - **How** it will be achieved
- ✈ Development process helps ensure
 - ✓ Goals (expected benefits) of planned airspace structure are clearly stated;
 - ✓ Objectives of the airspace change are met; and
 - ✓ the means chosen to achieve those benefits are appropriate to the goals as well as feasible within the resources available to the particular airspace system

Context of an Airspace Concept: Strategic Goals (Expected Benefits)

Safety?

Capacity?

Efficiency?

Environment?

Access?

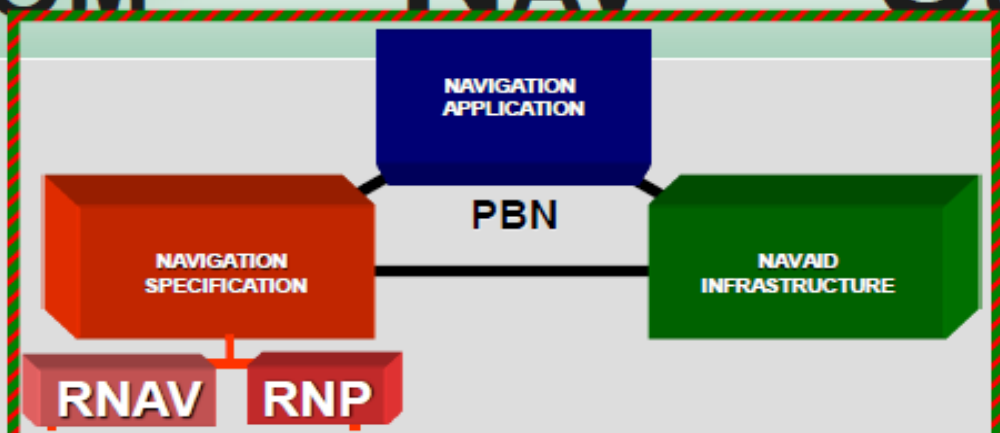
Airspace Concept

COM

NAV

SUR

ATM



Context of PBN: An Airspace Concept Enabler

Airspace Concept

COM

NAV

SUR

ATM

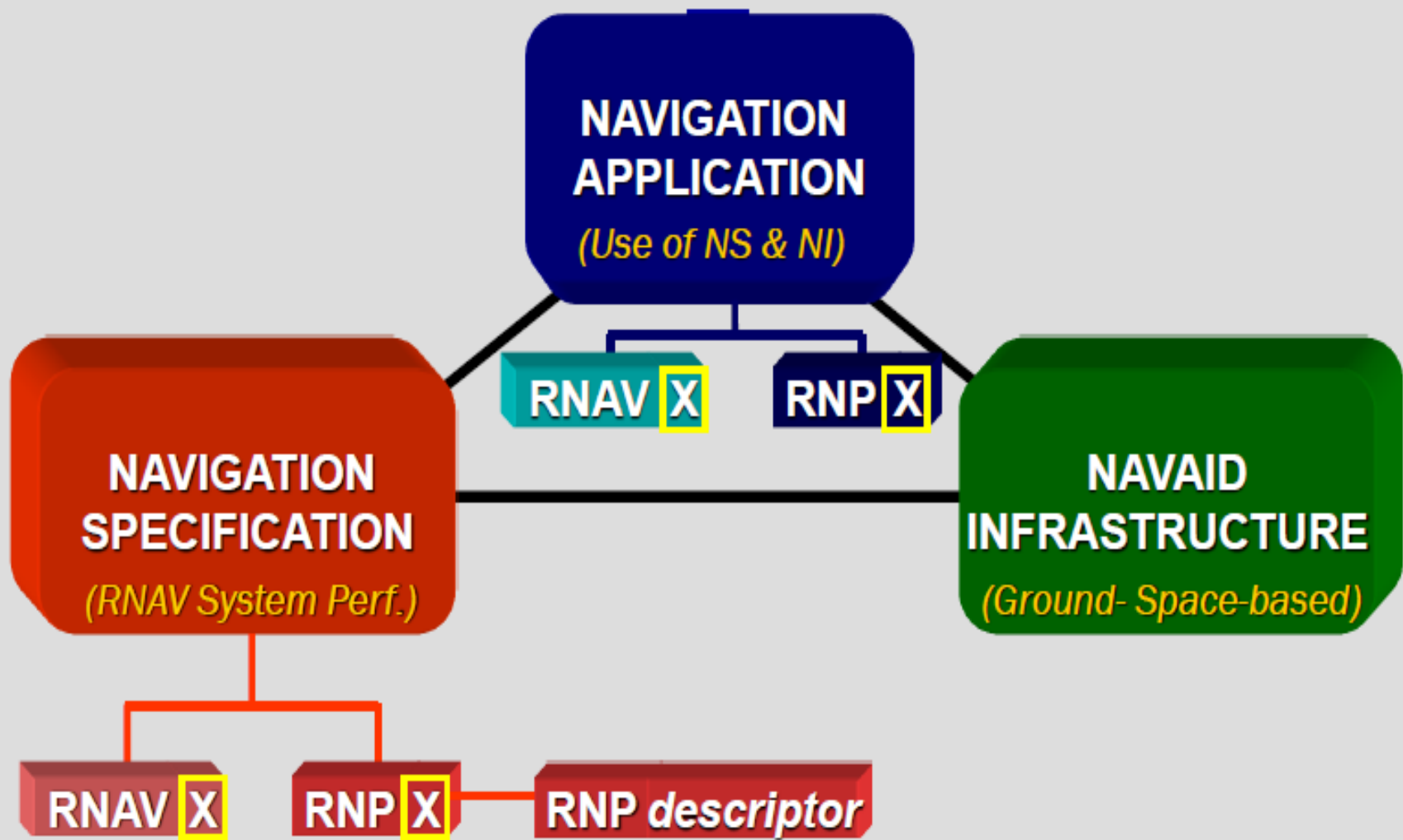
NAVIGATION
APPLICATION

PBN

NAVIGATION
SPECIFICATION

NAVAID
INFRASTRUCTURE

PBN Concept Review



THE BASICS OF PBN IS:

Performance Base Navigation;

Navigation based on specified system performance requirements for aircraft operating on a air traffic route, instrument approach procedure, or in a designated airspace

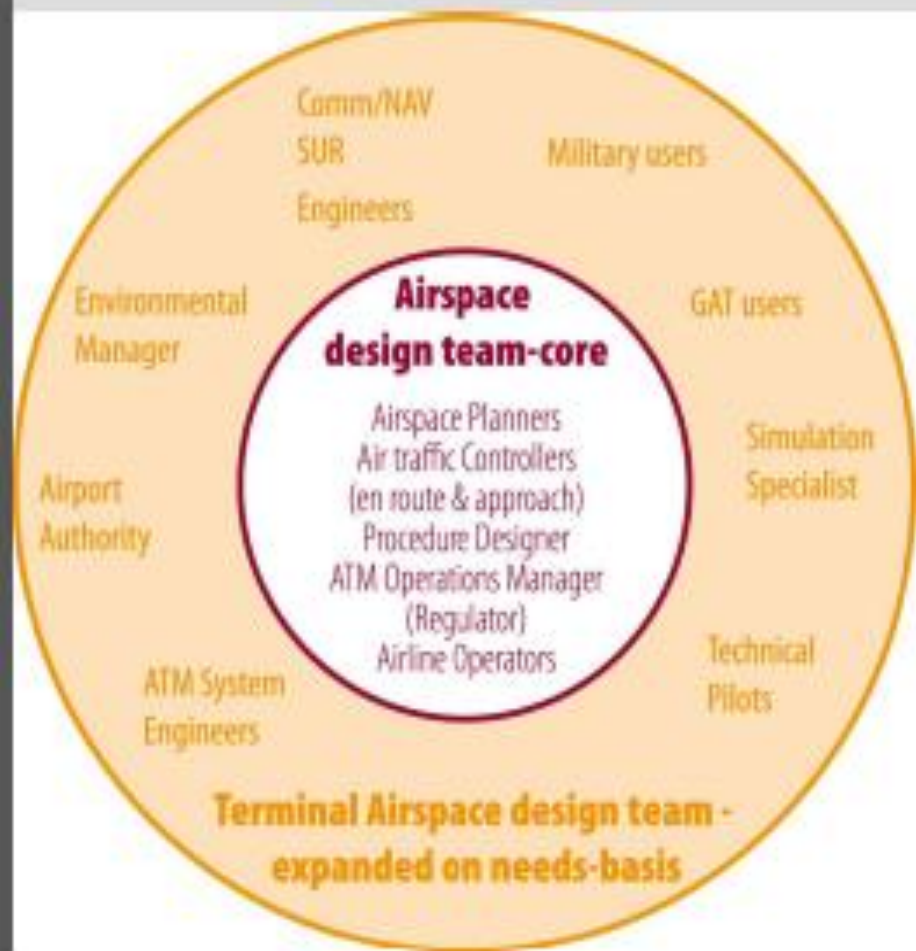
Performance Base Navigation

- The components of PBN are Area Navigation (RNAV) and Required Navigation Performance (RNP). The PBN concept specifies that aircraft RNAV system performance requirements be defined in terms of the accuracy, integrity, availability, continuity and functionality, which are needed for the proposed operations in the context of a particular airspace concept. The RNP system specifies all of the above for RNAV plus an **on-board monitoring and alerting system** for the pilot.

Who develops an Airspace Concept?

- ➔ A team effort by representatives of various organizations and technical specialties
- ➔ Particular composition of the team depends on the scale and nature of the project
 - A simple airspace concept (e.g. a SID, STAR and IAP) would have experts from
 - ANSP (including PANS OPS procedure designer)
 - civil aviation regulator
 - airport operator
 - operators' representative
 - A more extensive Airspace Concept (e.g. new runway, plan for terminal and enroute airspace) could also include
 - safety management system experts
 - simulation studies experts
 - additional operator representatives
 - environmental personnel

Airspace Concept Development Team



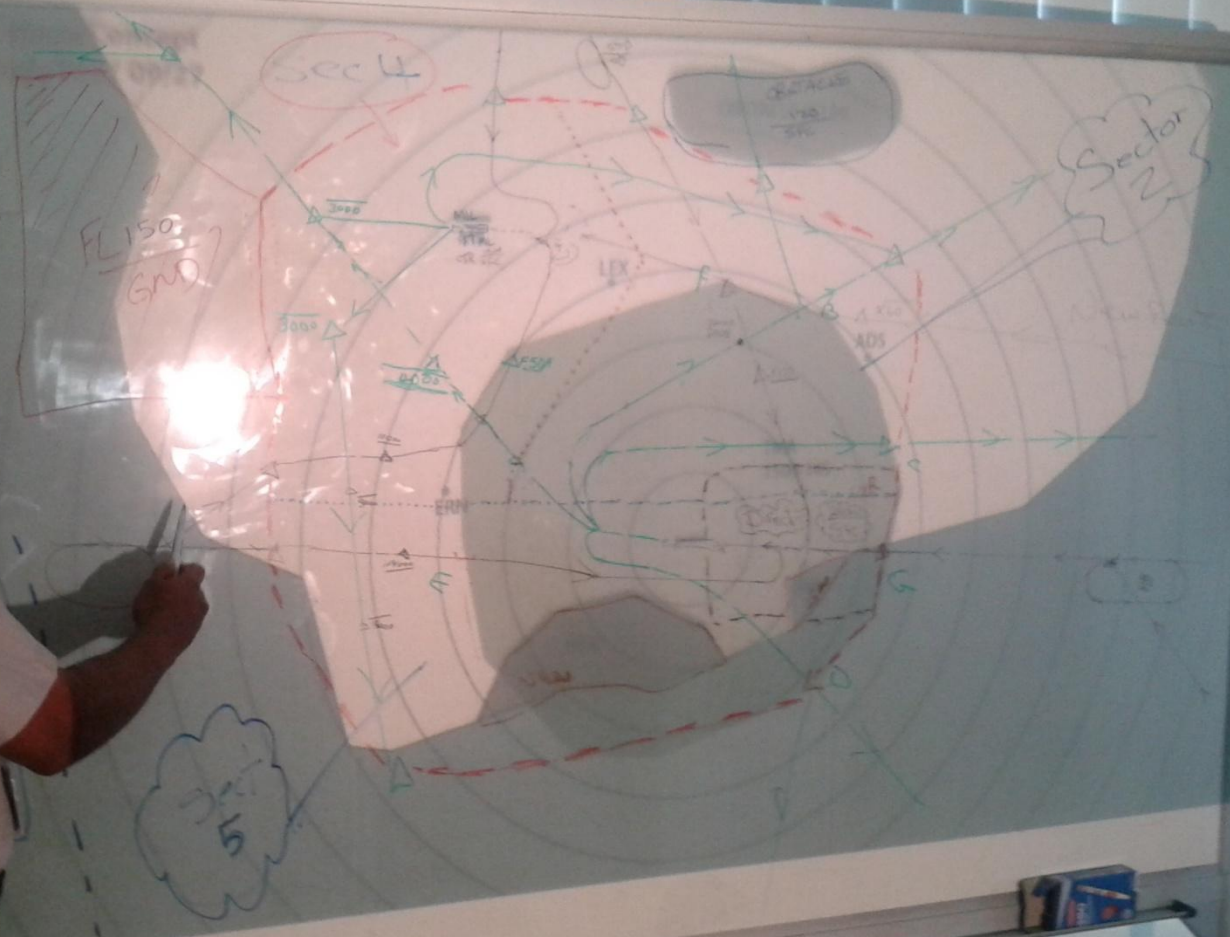
➔ Airspace Concept development requires the combined efforts of

- Air Navigation Service Providers;
- Regulators; and
- System Users

To Do What?

Important Numbers

Contact No.	Extension
Customer Manager	6140 6217 / 210
Cheryl	6140 3741
Public Visual Support	6140 6208 / 219
Facilities Support/Access	6140 6230 / 219
Home	6140 6233 / 215
Mobile	6140 6237 / 215
	6141 1913





Airspace Concept Development Team

1. **Identify and Prioritise** strategic objectives

Safety?

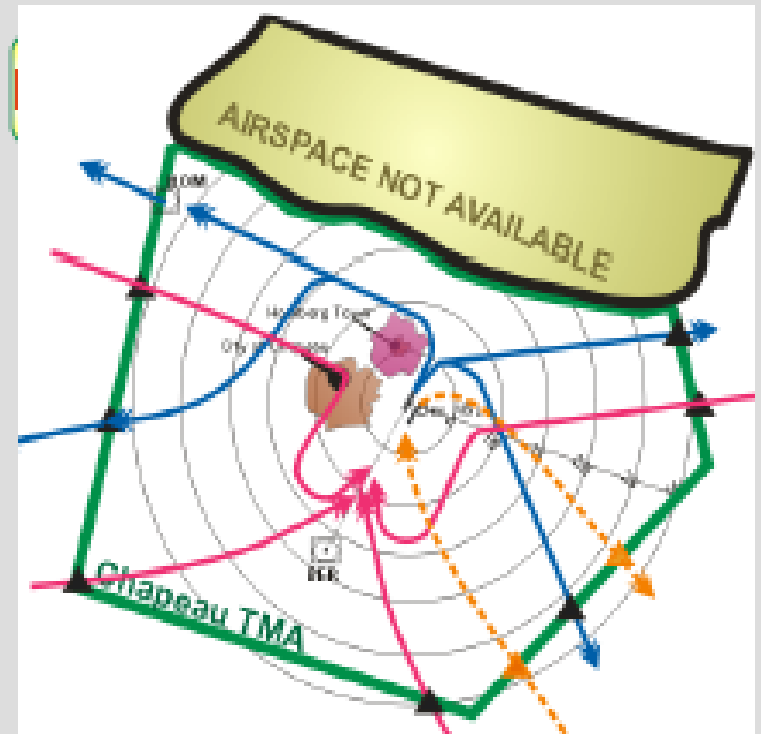
Efficiency?

Capacity?

2. **Develop the target**
airspace design

3. **Address enablers**

4. **Identify technical/operational assumptions**



ATM PROJECT

PBN IMPLEMENTATION

TIMEHRI
TMA

AIRSPACE
DESIGN

Routes (NAIP/PP)
Volumes
Sectors

AIRCRAFT
FLEET
GPS

AIRSPACE CONCEPT

COM

NAV

SUR

ATM

To Start with
VFR-MS
NAV SPEC

NAV APP

NAV INFRA

Use VFR
Route
Defined by rivers,
Canals, roads etc

- (1) VOR/DME
- (2) WGS-84 - Survey
- (3) GNSS - procedures

RNAV 5

AIRSPACE CONCEPT DEVELOPMENT "DESIGN"

Activity → "PLAN"

1. Agree on operational Req
2. Create airspace design Team
3. Agree on objectives - Scope & timescale
4. Analyse Reference Scenario
5. Select Safety Criteria
6. Agree CNS/ATM assumptions

7 → 8 - Initial Procedure design
Airspace design - Routes & Hds

9 - Airspace design - Volumes & Sectors

10 - Select KAO NAV-SPEC

AIRSPACE DESIGN

ACTIVITIES

FOR PBN IMPLEMENTATION

"VALIDATE"

11 - Airspace Concept Validation

12 - Finalisation of Procedure design

13 - Procedures Validation

"IMPLEMENT"

14 - Implementing Planning

15 - Implementation

16 - Post Impl. Review

Address Enablers

Capacity



Increase number of ATS routes to reduce congestion; accommodate projected growth

Communications

VHF? HF? Two Way?

Navigation

NAVAIDs?

- Primary/Reversionary?

Aircraft and Operator Capabilities?

Surveillance

Radar? Non-Radar?

Air Traffic Management

ATC Procedures? Workload? Automation?

Efficiency



Reduce delays that result from excessive "leveling off" flight profiles

Agree Assumptions



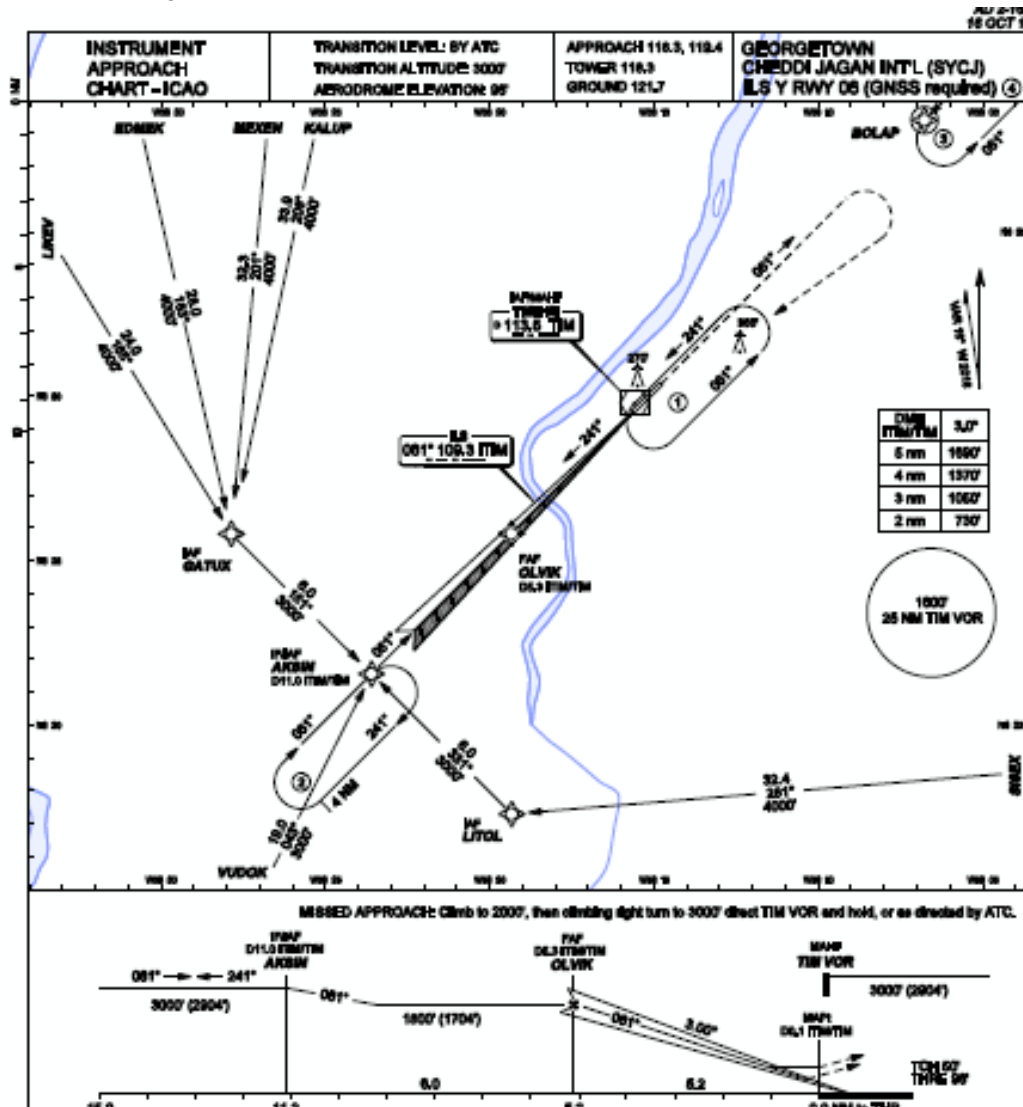
ASSUMPTIONS

- TWO AIRPORTS WITHIN THE TMA
- (1) SYCJ – 90% INT'L ARR/DEP,
- mostly jet aircraft,
- Types- B763/752/738/LJ35 etc.



ASSUMPTIONS

- ILS/RNAV/VOR APPROACHES



ASSUMPTIONS

- (2) SYGO – SMALL AIRPORT
- MOSTLY DOMESTIC ARR/DEP. (95%)
- VFR CONDITIONS – DAY
- RNAV APP.

TYPES



Conventional



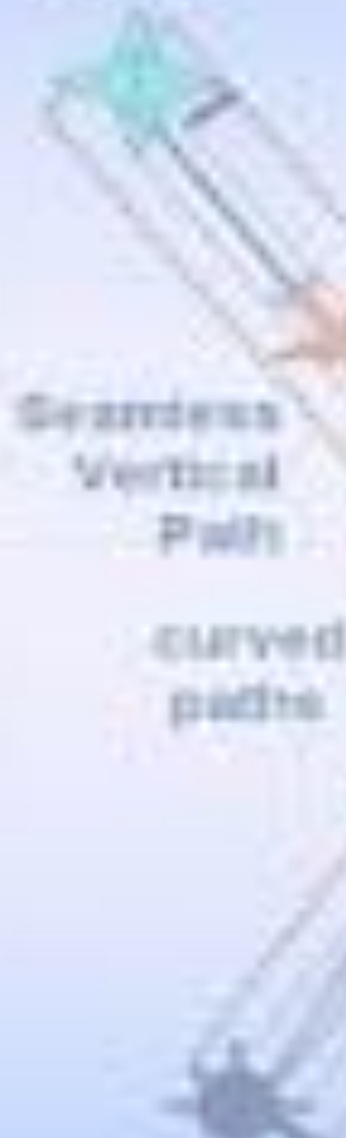
Limited Design Flexibility

RNAV



Increased Airspace Efficiency

RNP



Standard Vertical Path

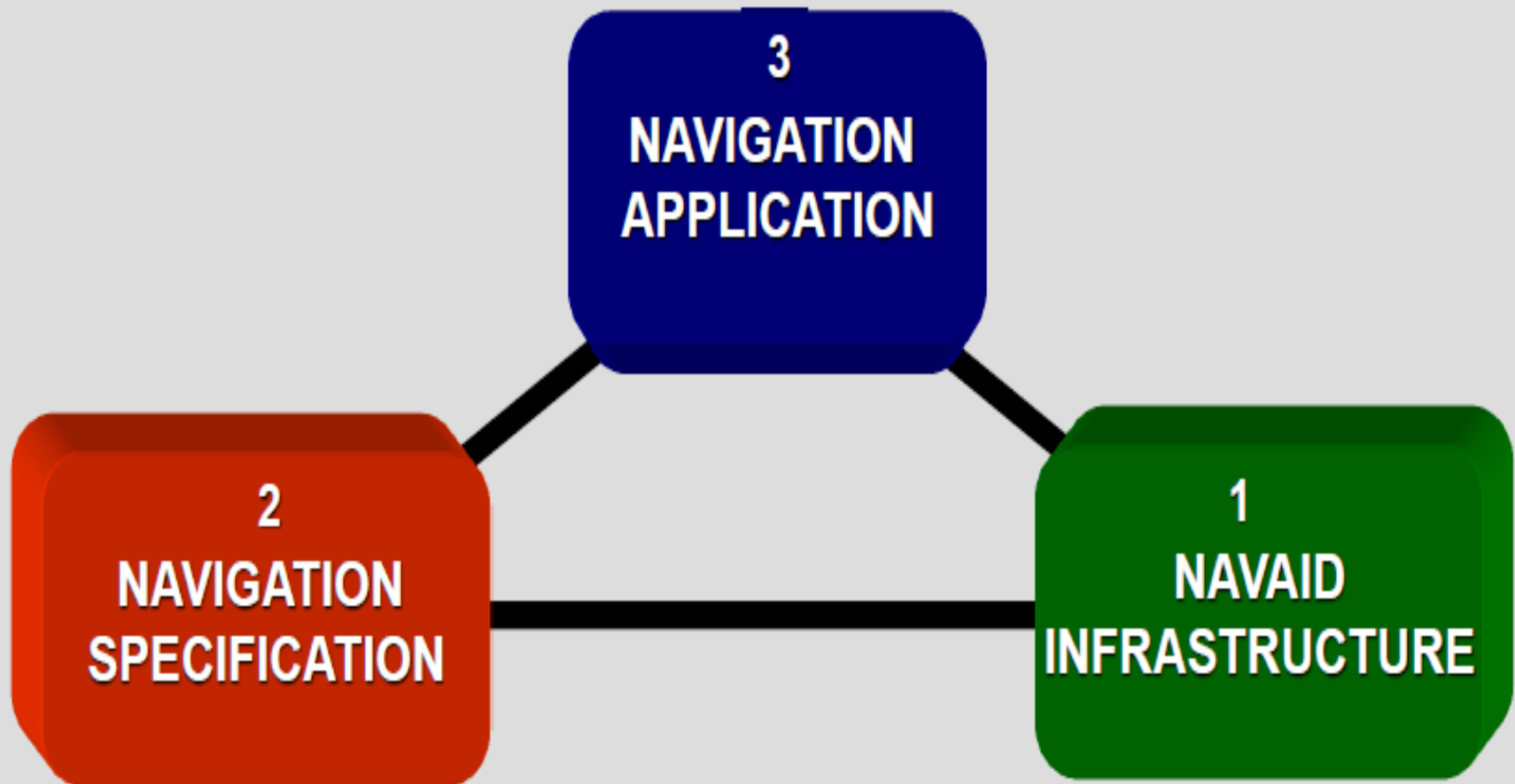
curved paths

Optimal Use of Alt

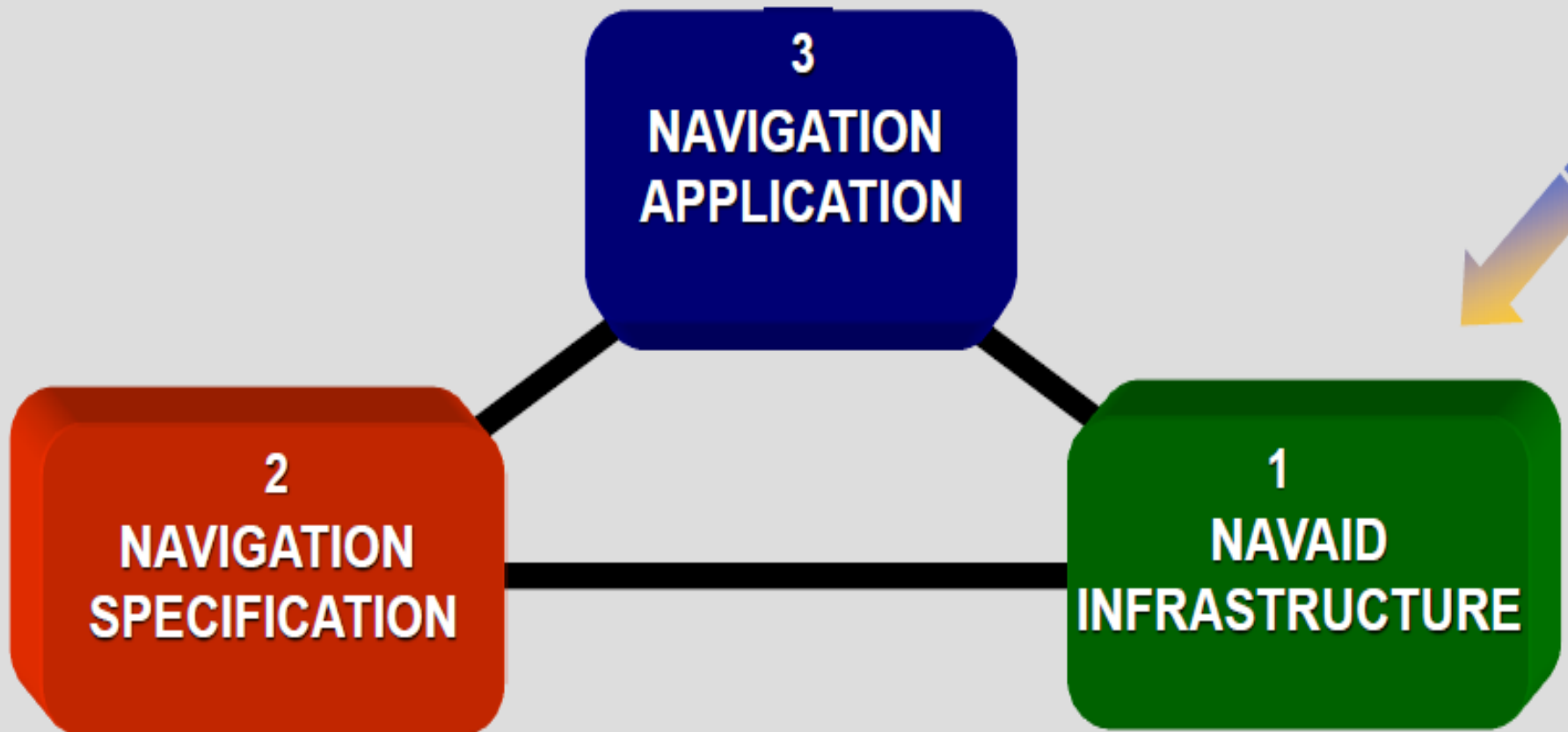
DESIGN CONSIDERATIONS

PBN

Components of PBN Concept



Components of PBN Concept



Components of PBN Concept

- Navaid Infrastructure -

- Ground-based Navigation Aids (Nav aids)
 - VOR; DME; (Not NDB)

- Space-based Nav aids
 - GNSS
 - GPS; Glonass; *future* Galileo

1
NAVAID
INFRASTRUCTURE

Components of PBN Concept - Navigation Specification -

ICAO NAVIGATION SPECIFICATIONS

RNAV SPECIFICATIONS

RNP SPECIFICATIONS

Designation
RNAV 10

*For Oceanic and Remote
Continental navigation
applications*

Designation

RNAV 5
RNAV 2
RNAV 1

*For En Route & Terminal
navigation applications*

Designation

RNP 4

*For Oceanic & Remote
Continental navigation
applications*

** Under development*

Designation

RNP 2*

B-RNP 1

A-RNP*

RNP 0.3*

RNP APCH*

RNP AR APCH

*for various phases of
flight*

Designation

**RNP with additional
requirements to be
determined
(e.g. 3D, 4D etc)**

International NS in Volume II of PBN Manual

DESIGN CONSIDERATIONS

- **Since PBN specification for Terminal Areas is RNAV 1, it would be necessary for the local**
- **aircraft fleet and crews to be GNSS certified in order to utilize the advantages of PBN**
- **technology. (*Sufficient time must be given for this process*)**

Aircraft - Equipment and Operator Approval

A

EQUIPMENT
LEVEL
APPROVAL



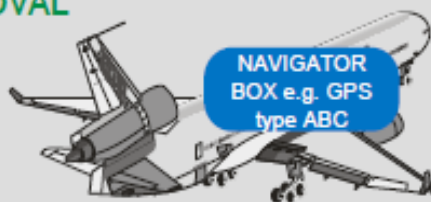
NAVIGATOR
BOX e.g. GPS
type ABC

Comments/Notes

- GPS could be a sensor in multi-sensor system or a self-contained and stand-alone navigator;
- FAA/EASA (E) TSO against a MOPS e.g. DO229, incl. functions, performance qualification. Attributes incl. accuracy, functionality (e.g. Nav database), integrity, alerting, path steering;

B*

AIRCRAFT
LEVEL
APPROVAL

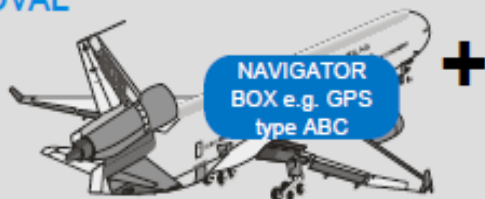


based on MASPs or PBN Nav Spec

- Installation approval on aircraft against an EASA AMC or FAA AC which includes an operational context e.g. RNAV 5;
- Takes into account a/c level integration e.g. displays, controls, interface with other systems e.g. auto-pilot; flight director; safety requirements and HF.

C†

OPERATOR
LEVEL
APPROVAL



- For the aircraft installation to be used by pilot, operational approval needed against, for example, EU-OPS 1.
- Operational Approval is concerned with training, flight crew procedures, quality, database management, etc.

DESIGN CONSIDERATIONS

- The design of the airspace while utilizing PBN concepts will allow for creation of SIDS and STARS and departure and arrival routes/procedures that would strategically de-conflict the traffic as far as practicable.
- Aircraft being cable of navigating along the desired tracks identifying the relevant way points/significant points using the current
- **Nav aids (TIM VOR/DME) and other prominent geographical locations that are familiar to most**
- flight crews and ATCOS.,

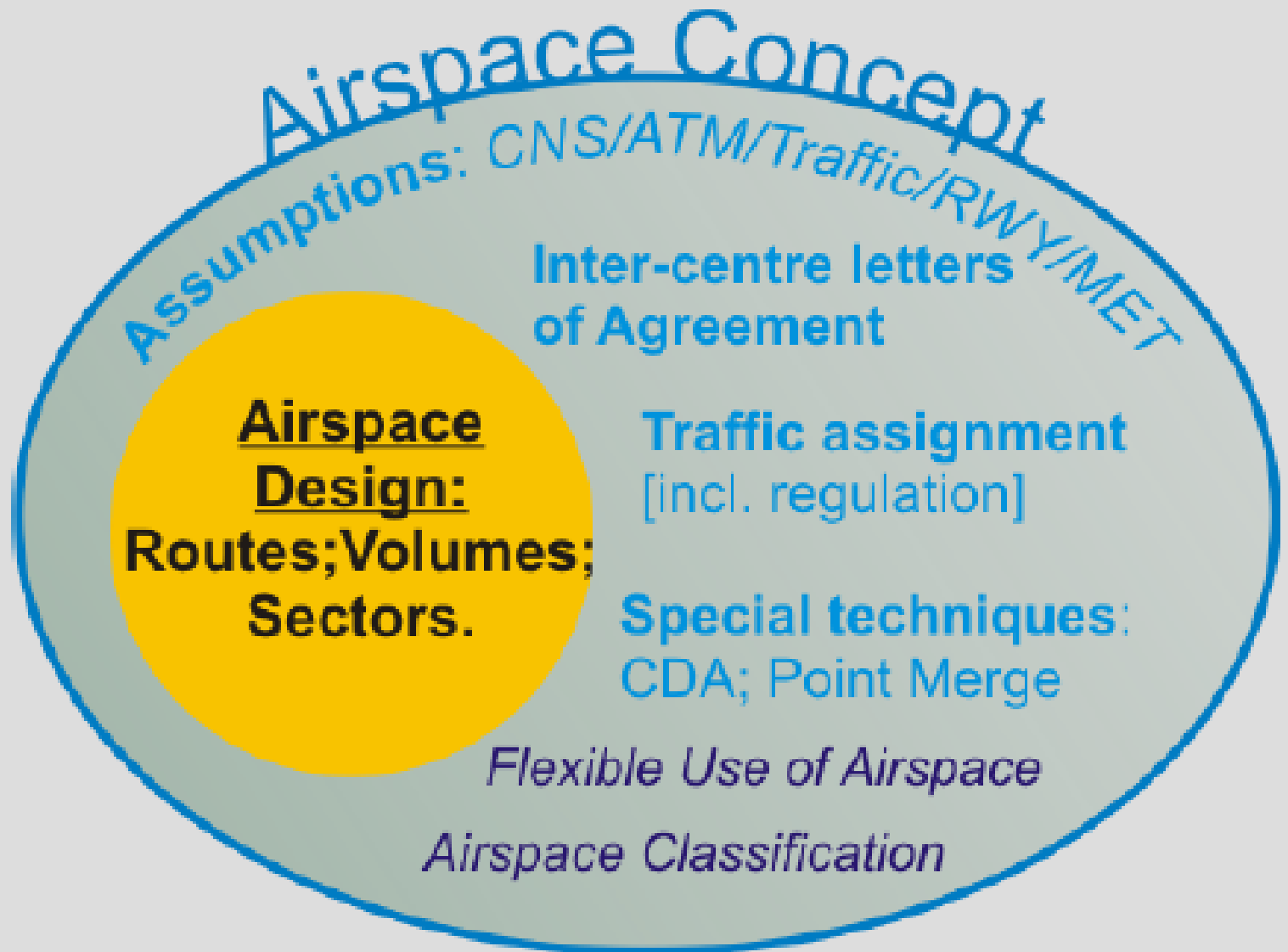
TMA DESIGN

- **Standard Instrument Departure (SID), Standard Arrival Routes (STAR) and Terminal Routes.**
- SYCJ – RWY06: This RWY is predominantly used for arrivals, utilizing the ILS RWY06 approach procedure.
- The design of one SID and one STAR to link RWY06 will strategically de-conflict arrivals and departures at SYCJ.

TMA DESIGN

- **Standard Departure (SD) and Standard Arrival Routes (STAR) –visual.**
- SYGO – RWY07: This RWY is predominantly used for arrivals, utilizing the RNAV RWY07/Visual approach procedure or VFR arrival procedures.
- The design of SDs and STARs - Visual to link RWY07 will strategically de-conflict arrivals and departures at SYGO.

Conclusion



END OF PRESENTATION

THANK YOU.

COMMENTS

