



**INTERNATIONAL CIVIL AVIATION ORGANIZATION**

*A United Nations Specialized Agency*

# Airspace Organization and Management

Asia and Pacific Regional Sub-Office

2014

# CONTENTS



- **Concept of Flexible Use of Airspace (FUA)**
- **Flexible and adaptable airspace structure**
- **Conditional Route(CDR)and CMAC process**
- **ASM and the consistency in ATM**



# CONCEPT OF FUA

# WHAT IS ASM



- ***Airspace Management (ASM)*** : Is a **process** by which airspace options are selected and applied to meet the needs of the airspace users
- ***The ultimate goal of ASM*** : Is to achieve the **most efficient use of the airspace** based on actual needs and, when possible, **avoiding permanent airspace segregation**

# ASM GUIDING PRINCIPLES AND STRATEGIES



- All available airspace should be managed **flexibly**;
- Airspace management processes should **accommodate dynamic flight trajectories** and provide optimum operational solutions;
- When conditions require that different types of traffic be segregated by airspace organization, the size, shape, and time regulation of that airspace should be set as to **minimize the impact** on operations;

# ASM GUIDING PRINCIPLES AND STRATEGIES



- Airspace use should be coordinated and monitored in order to accommodate the conflicting requirements of all users and to **minimize any constraints** on operations;
- Airspace reservations should be planned in advance with changes made **dynamically** whenever possible. The system also needs to accommodate short-notice unplanned requirements; and
- Complexity of operations may limit the degree of **flexibility**.

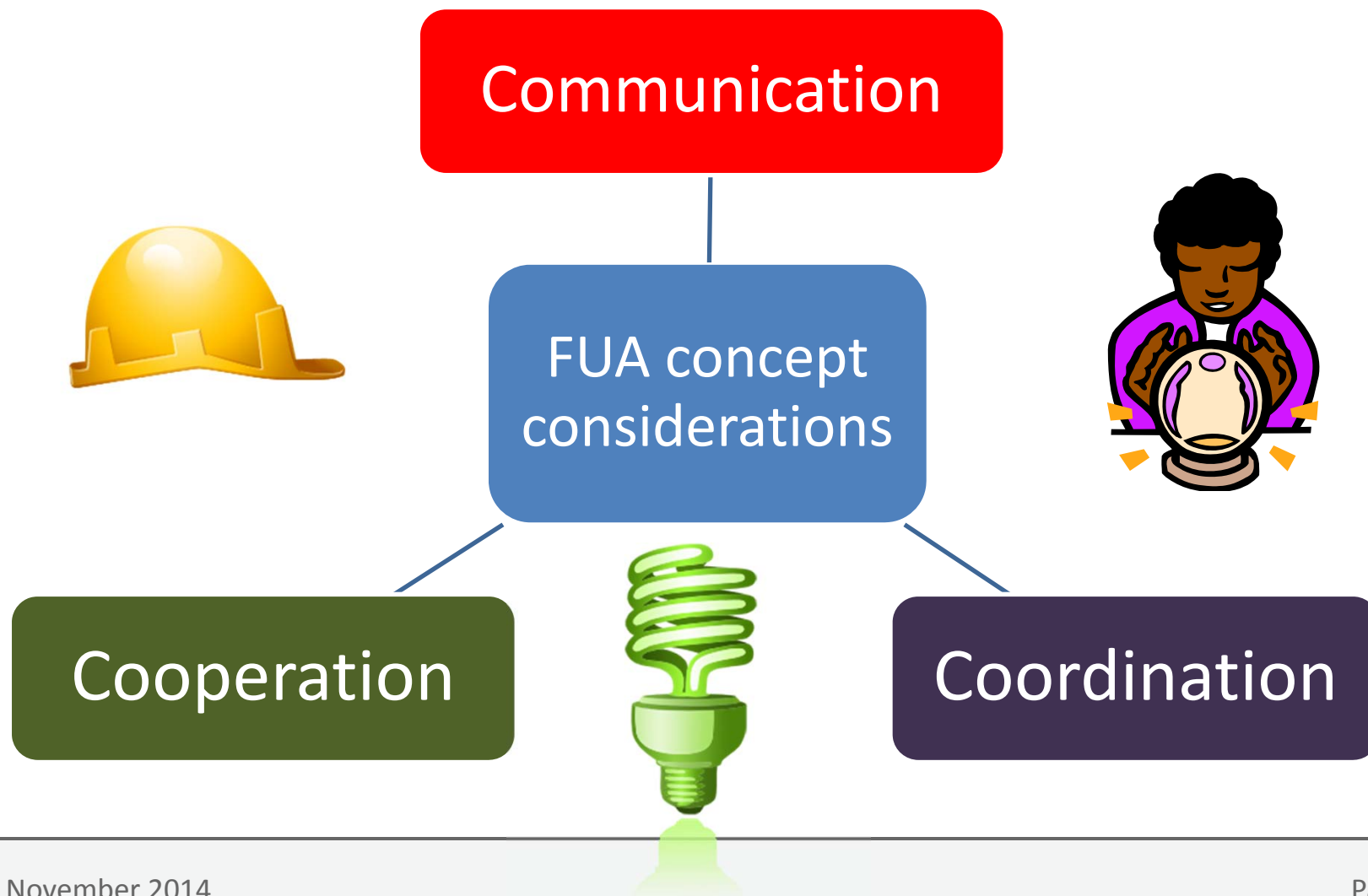
# FLEXIBLE USE OF AIRSPACE (FUA)



What is Flexible Use of Airspace(FUA)?

- An airspace management concept
- A methodology of capacity management
- Key Points
  - Not owned by civil or military
  - Segregated temporarily
  - Managed dynamically
  - Contiguous volumes of airspace are not constrained by national boundaries

# FUA CONCEPT CONSIDERATIONS



# Question: Which one is more efficient and more effective



A



B

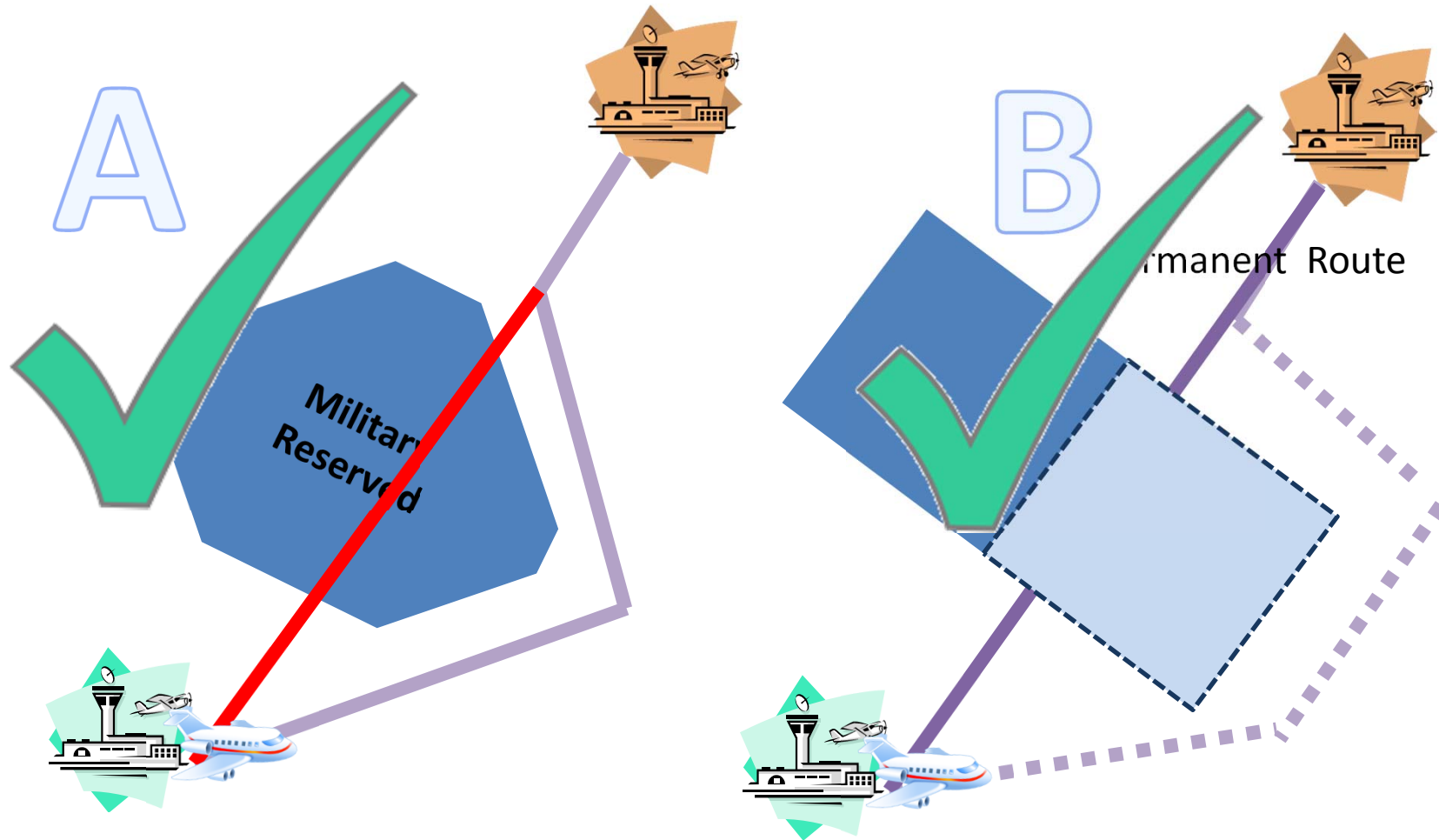


# IMPLEMENTATION OF FUA



- The first Option
  - Allow temporary access to civilian users into **military restricted and reserved airspace** for optimum use of the airspace and benefit civil operations
- Another Option
  - Allow temporary access to military users into **civilian restricted and reserved airspace** to facilitate the training and other missions.

# Question: Which one is the correct FUA Concept?



# Prerequisites of FUA



**National, high-level civil/military coordination body**

**Consistent collaborative national airspace planning process**

**Communication, negotiation, and priority rules and procedures for CMAC**

**Publication of procedures for activities which require airspace reservation or restriction.**

**Framework agreements between civil and military authorities**

**System of periodically review airspace needs, organization and management**

**Predictive and timely access to restricted or reserved airspace**

# BENEFITS of FUA



- Reduce distance, time and fuel
  - Increase flight economy
- Enhance ATS route network and associated sectorisation
  - Increase ATC capacity
  - Reduce Air Traffic delays
- Temporary airspace reservations are more closely in line with military operational requirements
  - Better response to specific military requirements

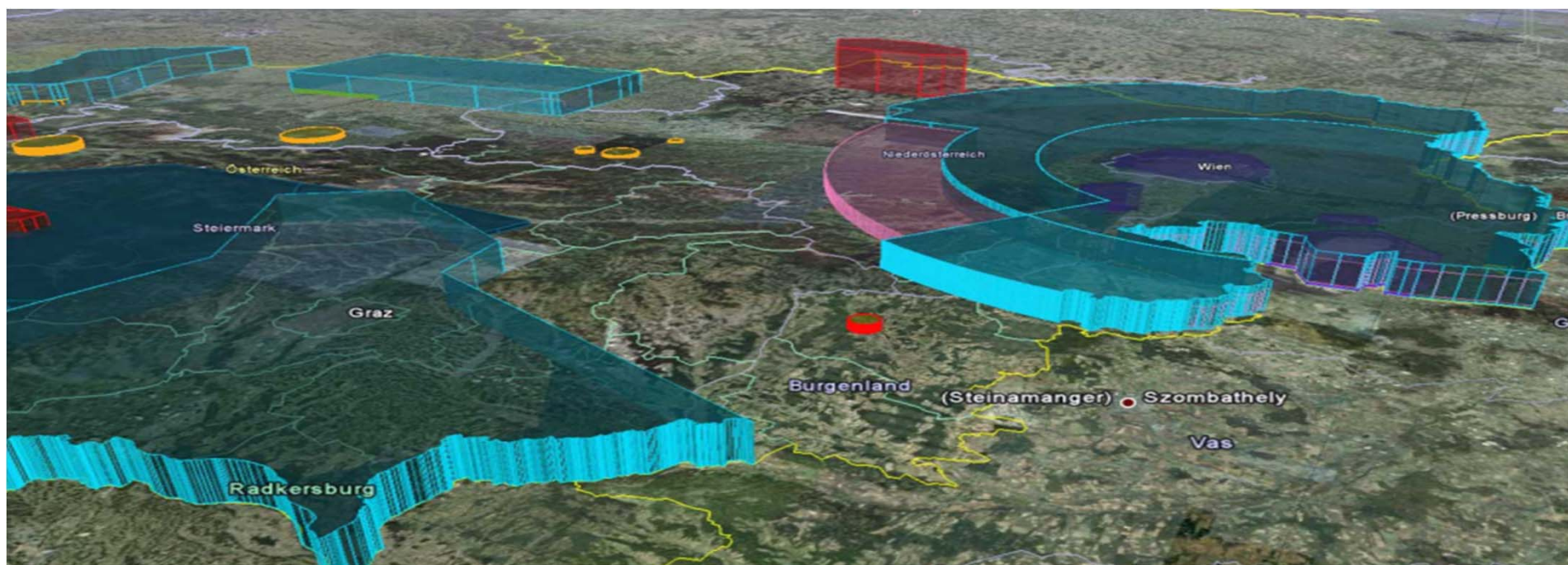


# FLEXIBLE AND ADAPTABLE AIRSPACE STRUCTURE

# AIRSPACE STRUCTURES



- Airspace Structures includes: Controlled Airspace, ATS Routes, CDRs, ATC Sectors, Danger Areas (D), Restricted Areas (R), Areas (P), Temporary Segregated Areas (TSA), Temporary Reserved Areas (TRA), Cross-Border Areas (CBA)



# FLEXIBLE AIRSPACE STRUCTURE



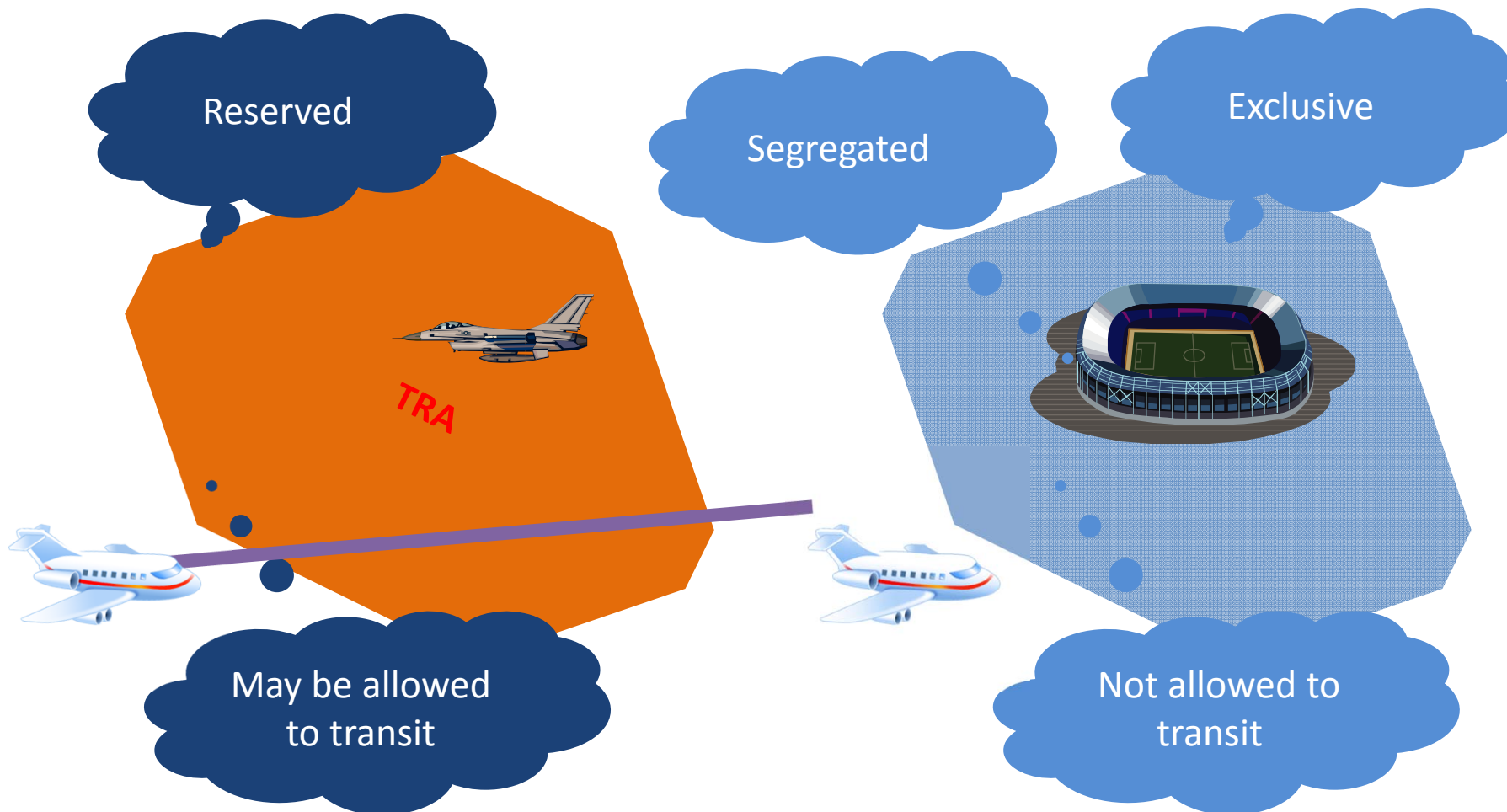
- Flexible airspace structures are **suited to temporary allocation and utilization**
- These airspaces require **dedicated coordination procedures** for activation/de-activation.

# FLEXIBLE AIRSPACE STRUCTURE



- Conditional Route (**CDR**)
- Temporary Reserved Area (**TRA**)
- Temporary Segregated Area(**TSA**)
- Cross-border areas(**CBA**)

# Question : What are the differences?



# TSA and TRA

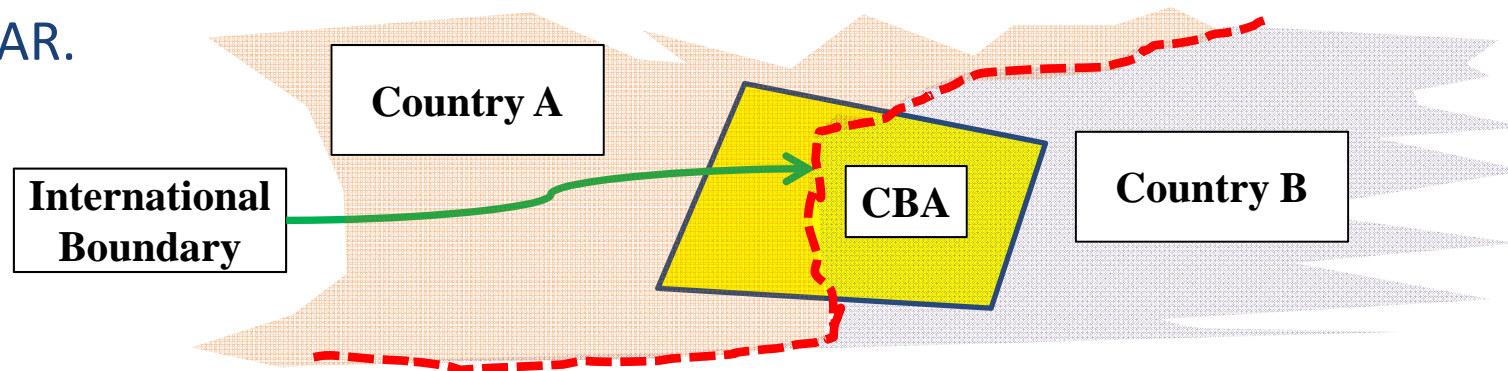


| Temporary Reserved Area (TRA)   | Temporary Segregated Airspace (TSA)   |
|---|---|
| Temporarily <b>reserved</b> and allocated for the specific use of a particular user | Temporarily <b>segregated</b> and allocated for the <b>exclusive</b> use of a particular user |
| During a determined period of time  | During a determined period of time  |
| Other traffic <b>may be allowed</b> to transit through under ATC clearance          | Other traffic <b>will not be allowed</b> to transit through                                   |

# Cross Border Area (CBA)



- TRA or TSA established for specific operational requirements over international boundaries. Established to allow **military training or operational flights**.
- Not constrained by national boundaries. Assist in the improvement of ATS route network.
- Political, legal, technical and operational agreements between States needed prior to establishment .
- Formal agreements prior to establishment are needed to address issues of sovereignty, defense, legality, operations, environment and SAR.





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# CDR AND CMAC PROCESS

# Conditional Route (CDR) Concept



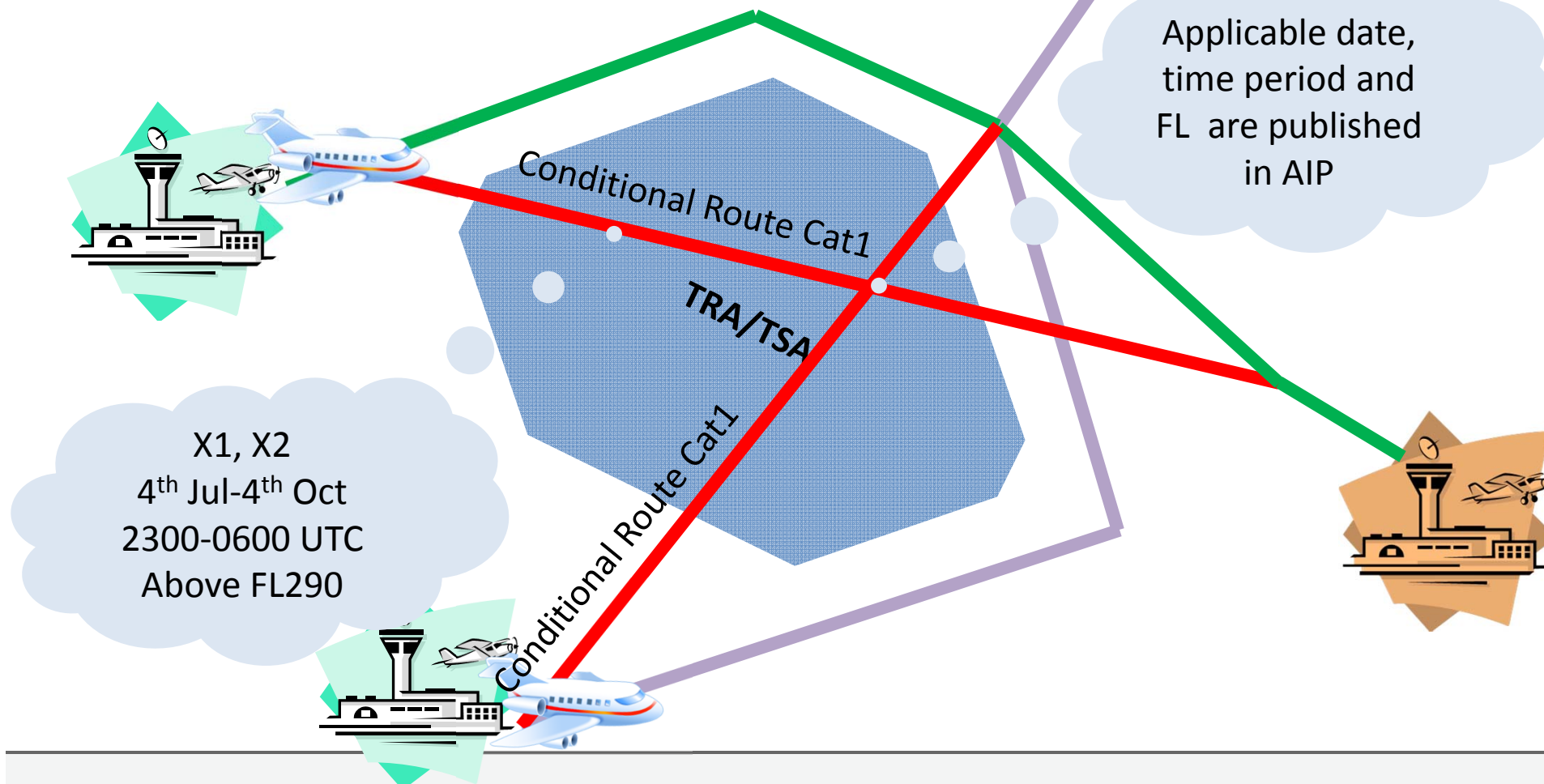
CDR—A non-permanent ATS route or portion thereof which can be planned and used under specified conditions.

- Through TRA, TSA or CBA
- Opening/closure results from associated military activities or purely civil needs
- Usually be established and utilized as pre-planned routing scenarios
- Permits the definition of more direct alternative routes by complementing and linking to the existing ATS route network

# CDR CATEGORIES-CDR1



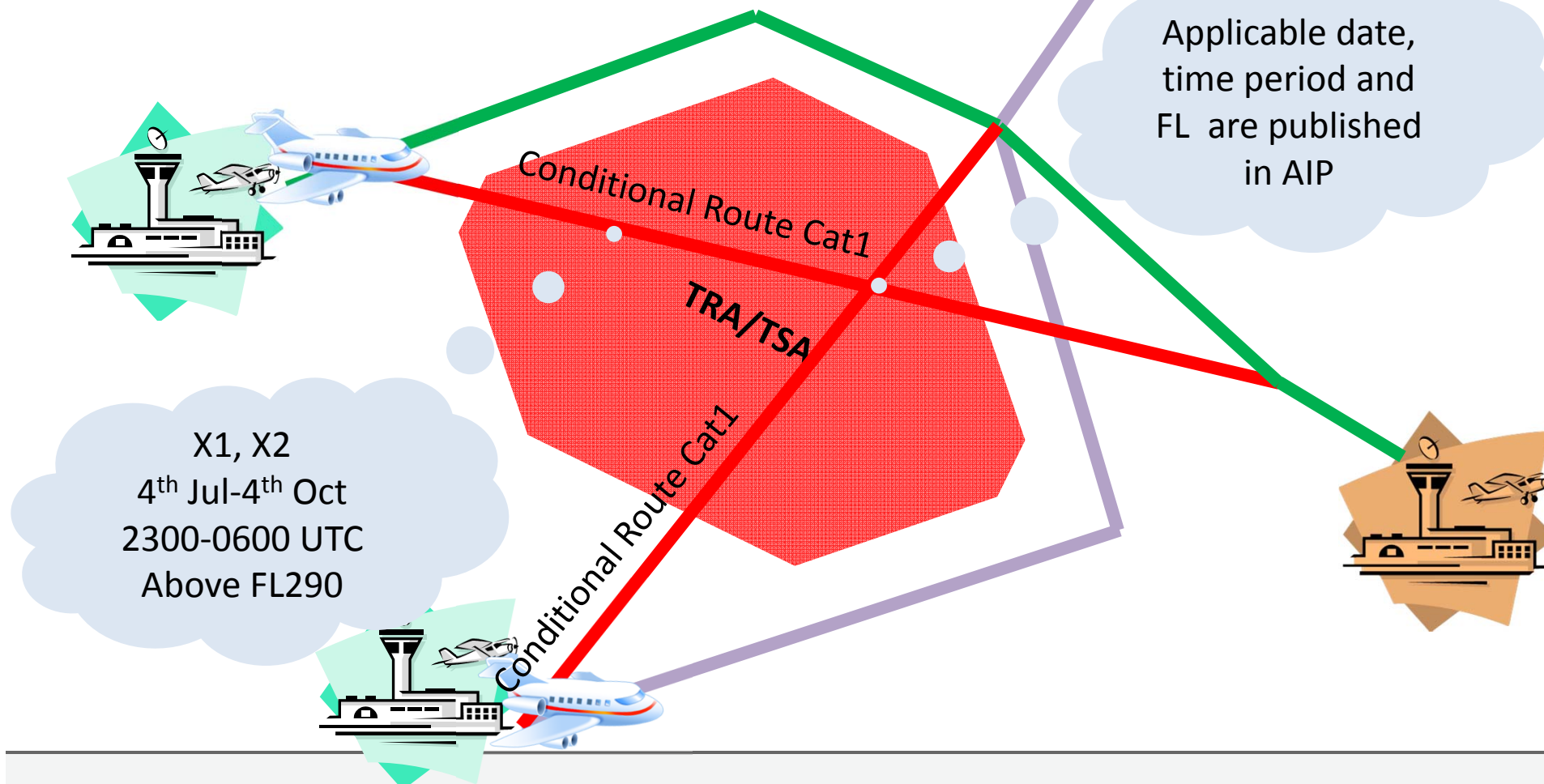
## Permanently Planable



# CDR CATEGORIES-CDR1



## Permanently Planable



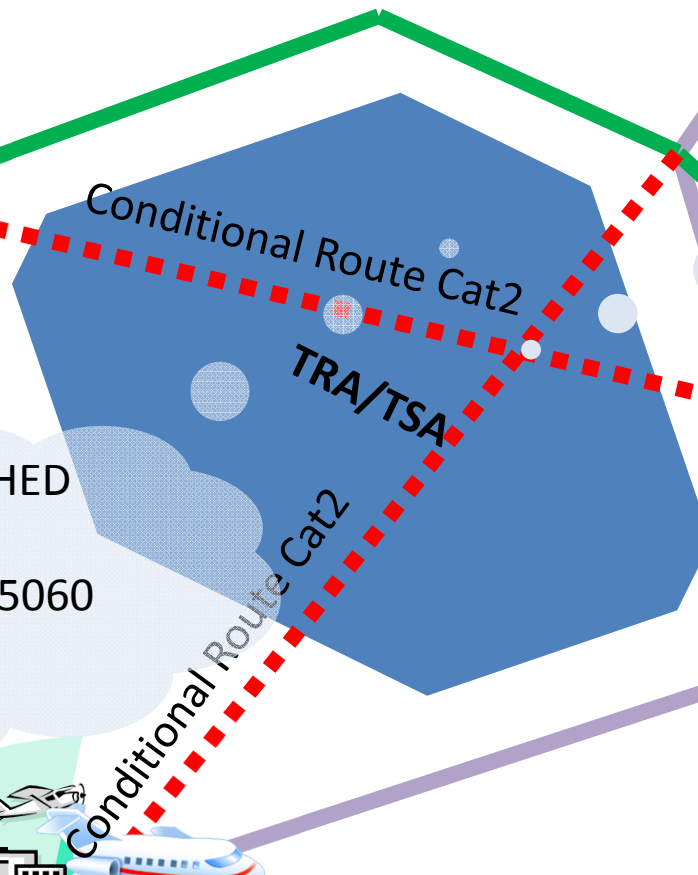
# CDR CATEGORIES-CDR2



## Non-Permanently Plannable



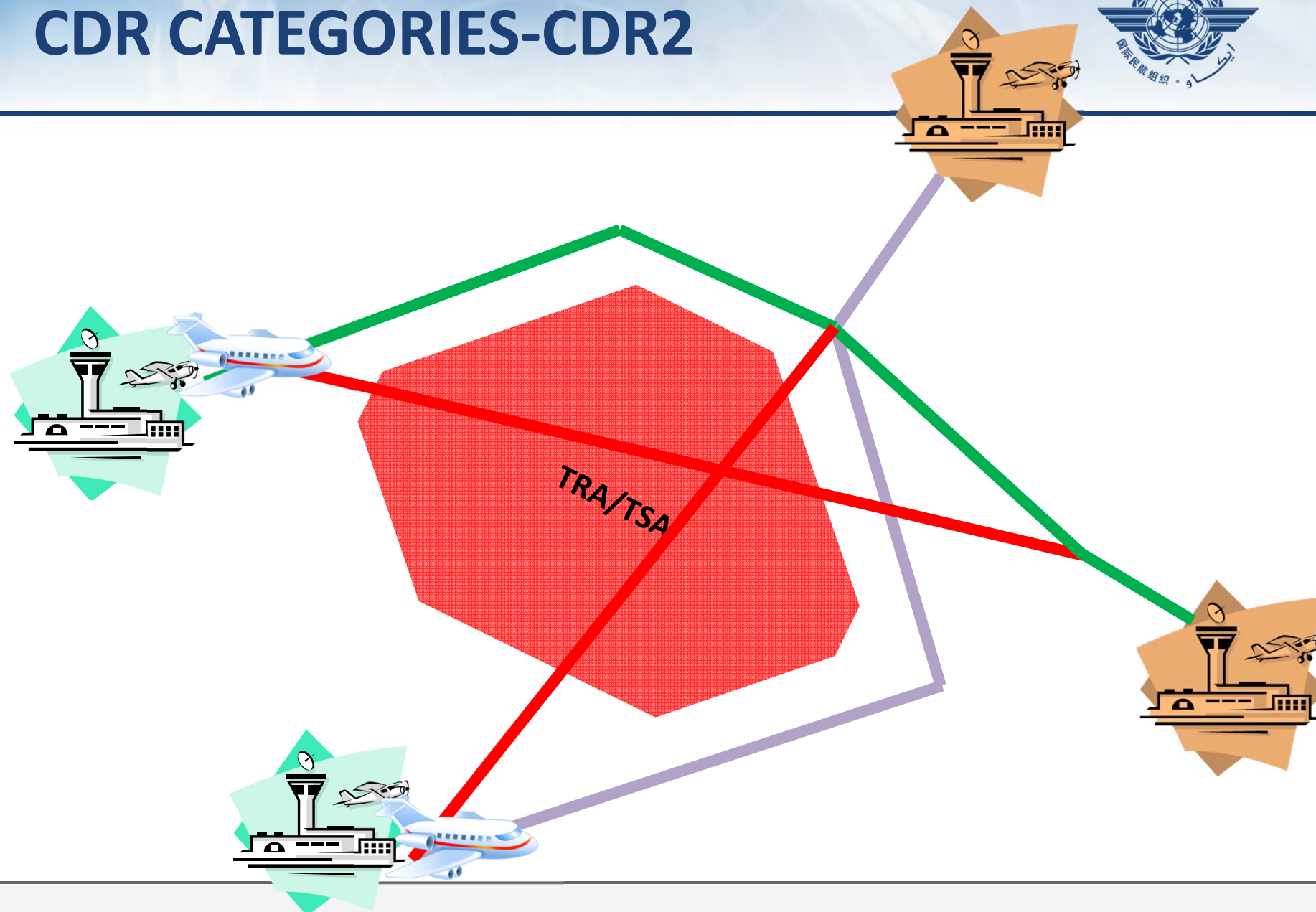
CDR ARE ESTABLISHED  
AS FLW: X1,X2  
1406042300/140605060  
0  
ABOVE FL290



Applicable date,  
time period and  
FL are notified by  
NOTAM



# CDR CATEGORIES-CDR2



# CDR CATEGORIES-CDR3



Applicable time period and FL are Notified real time



Conditional Route Cat3

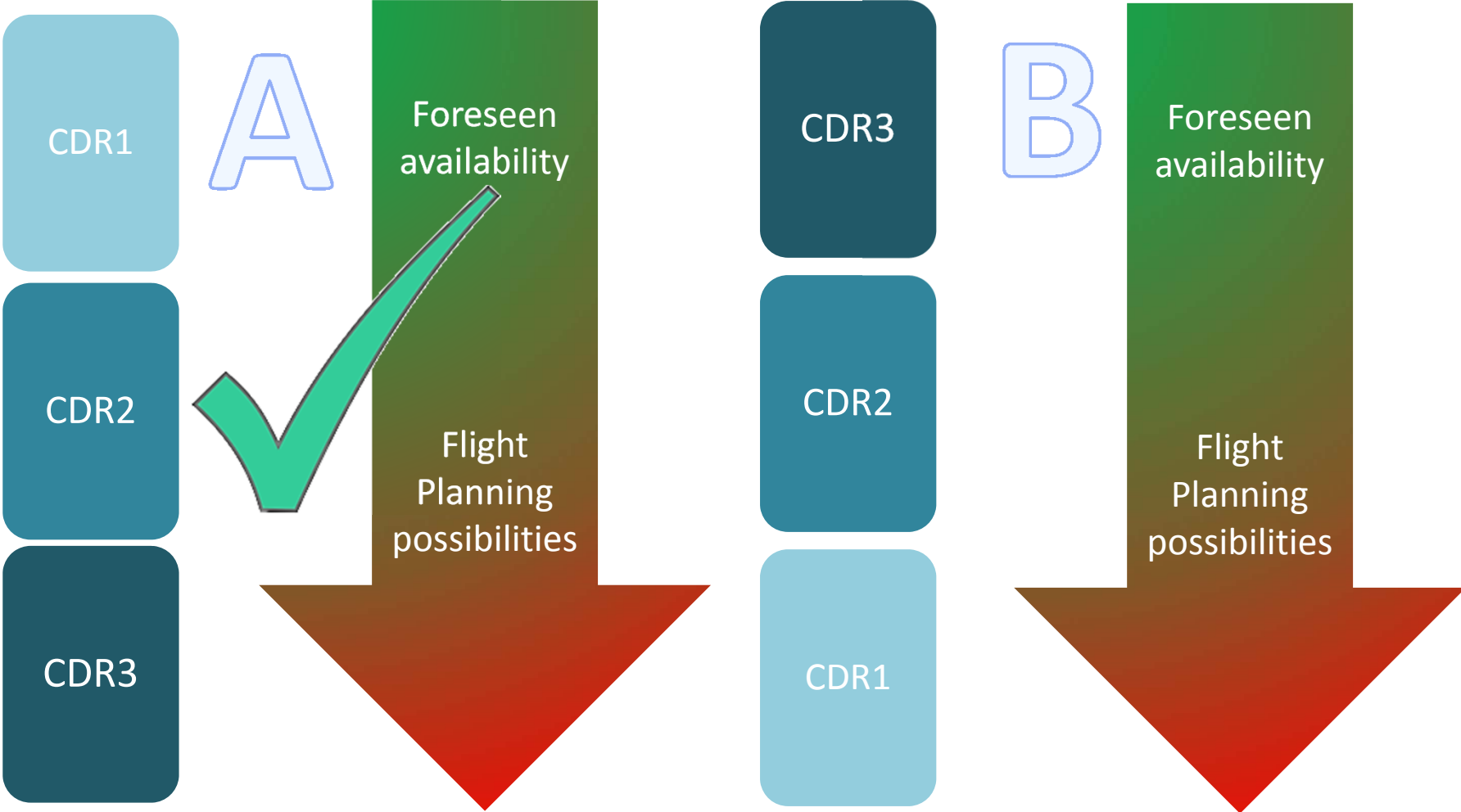
TRA/TSA

Conditional Route Cat3

X1, X2 is available from now to 0600 UTC Above FL290



# Question: Which one is correct?



# CDR CATEGORIES



## CDR1

- Expected to be available for most of the time
- Plannable in the same way as all permanent routes
- In the event of short notice unavailability, re-routing around active TSA on ATC instructions

## CDR2

- Coordinated and allocated on Day to Day basis as a response to ATC capacity imbalance
- Plannable only in accordance with NOTAM
- Part of pre-defined routing scenario

## CDR3

- Usable on ATC instructions only
- Use as short notice routing

Foreseen  
availability

Flight  
Planning  
possibilities

# Examples: CDR 1, 2 & 3



UL612 (LG) TRL SIT

**CDR1:**

ABOVE FL245 H24.

BELOW FL245:

MON-THU 2100-0400, FRI 1300 - MON  
0400 AND

**HOL 2100 THE DAY BEFORE - 0400 THE  
DAY AFTER.**

**CDR 2:**

FL205-FL245 MON-THU 0400-2100

AND

FRI 0400-1300.

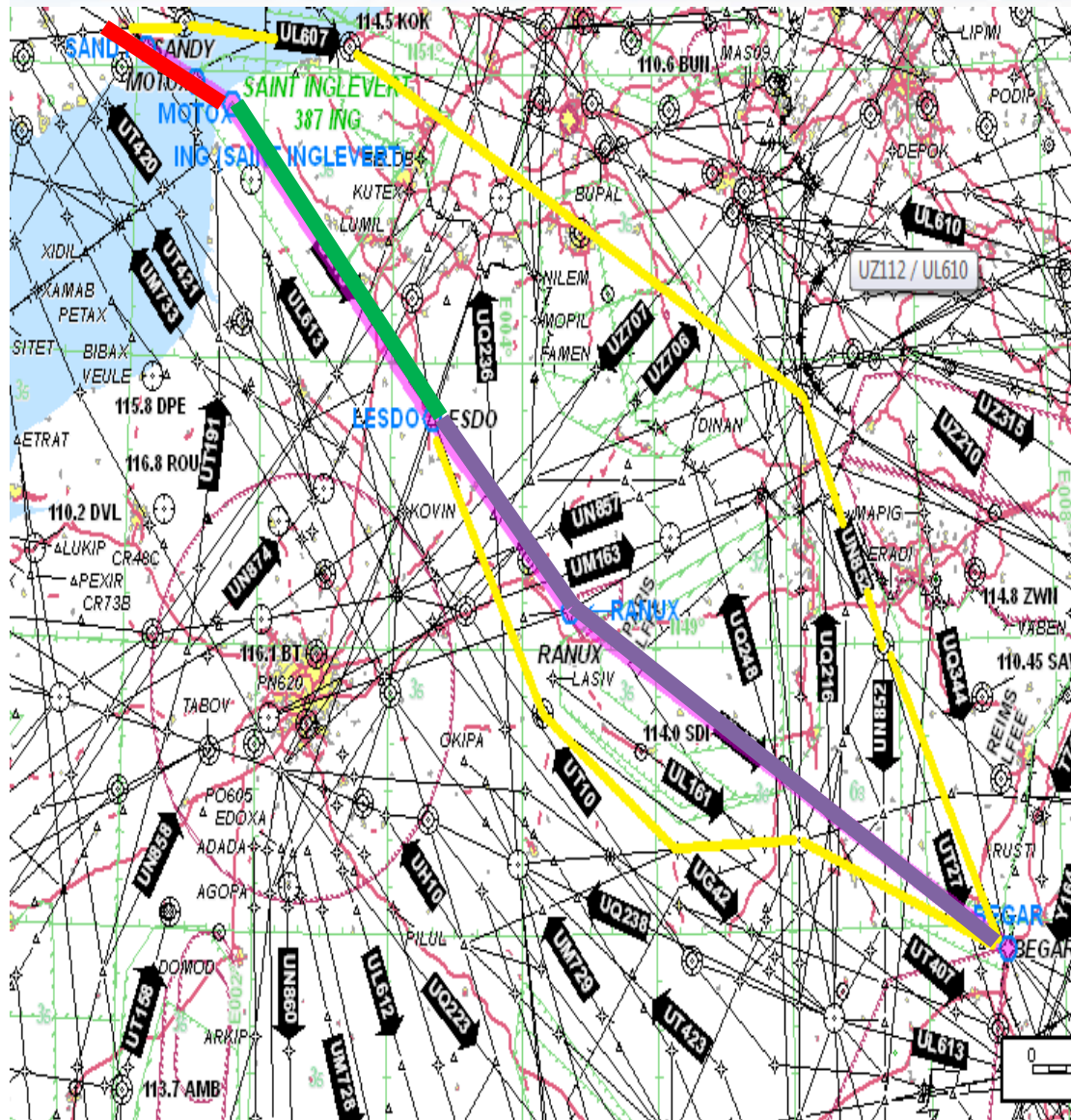
**CDR 3:**

BELOW FL205 MON-THU 0400-2100

AND FRI 0400-1300.



# Example: Multi States, Sectors, CDRs



UL15 EG SANDY MOTOX  
TIME: **CDR2: H24**  
LEVEL: **CDR2: FL245 to FL460**

UL15 LF MOTOX LESDO  
TIME: **CDR2: H24.**  
RE-ROUTING VIA UL607 BY KOK IN  
CASE OF DEFENCE ACTIVITY.  
LEVEL: **CDR2: FL345-FL500. ODD FL**

UL15 LF LESDO BEGAR  
TIME: **CDR1: WEEK-END AND  
NIGHTS.** RE-ROUTING VIA LESDO-  
UG42-LUVAL-UN491-BEGAR IN CASE  
OF DEFENCE ACTIVITY.  
LEVEL: **CDR1: FL345-FL500 (OBAKI-  
BEGAR FL195-FL500), ODD FL.**

# CDR IN THREE LEVELS ASM



**Strategic Level 1** – **Establish** CDR structure and CMAC procedures

**Pre-tactical Level 2** – Pre-coordinate and **Allocated** at least one day before operation

**Tactical Level 3** — coordinate and utilize in Real-time

# Level 1 (Strategic) CMAC Process



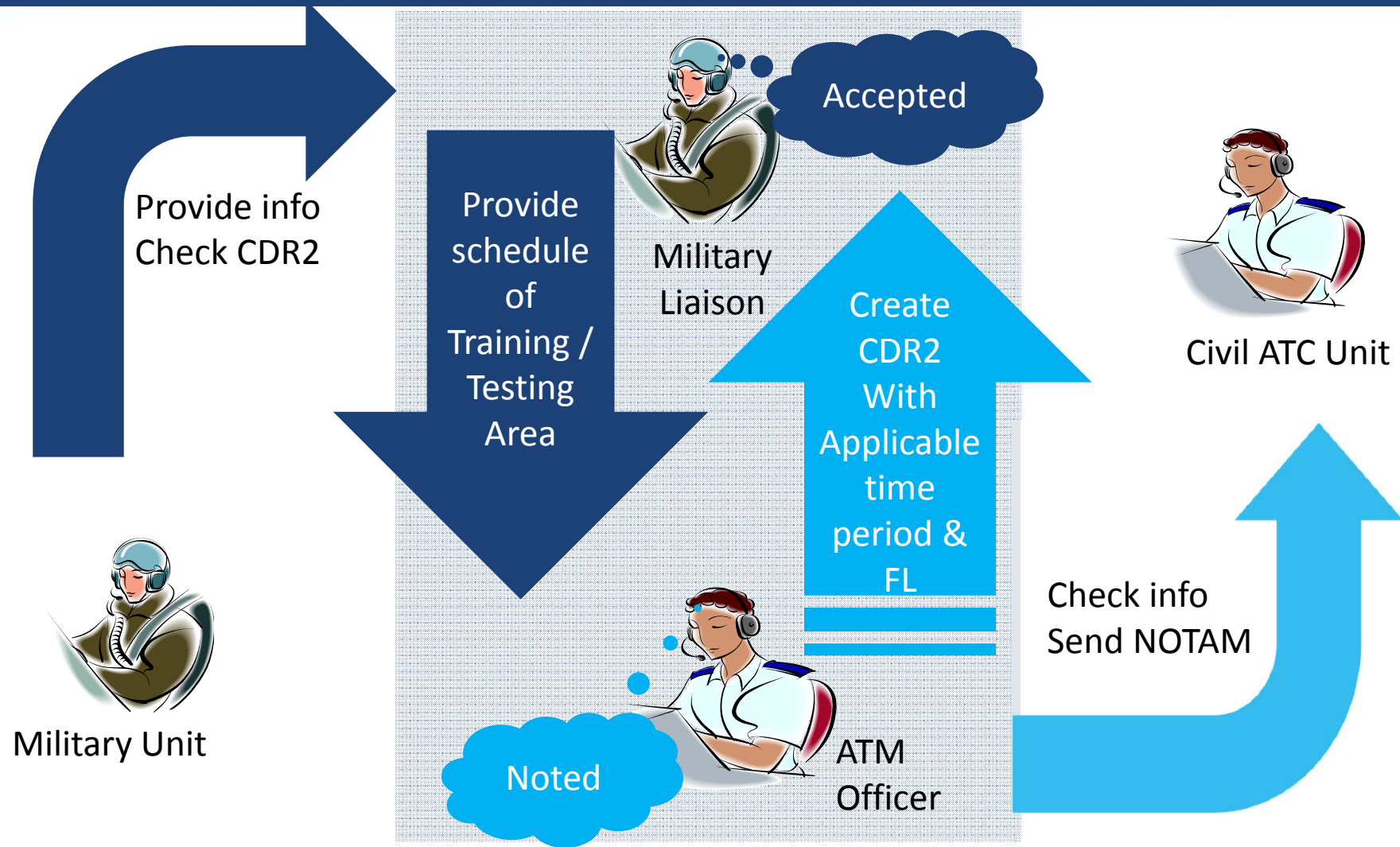
**Collect and  
validate user  
requirements**

**Coordinate and  
conciliate airspace  
availability**

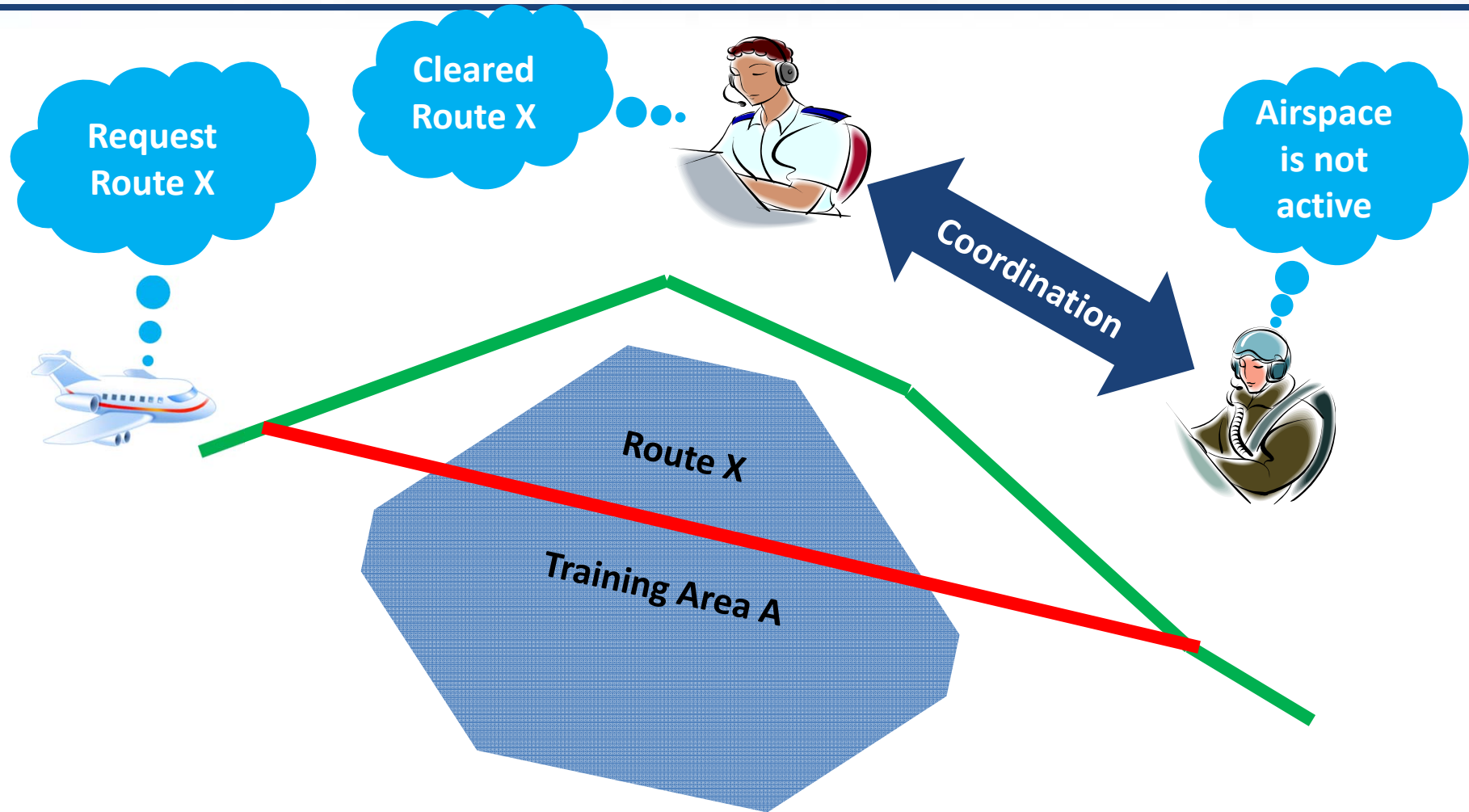
**Design and  
validate CDR  
based on  
permanent route  
structure**

**Publish CDR  
structure**

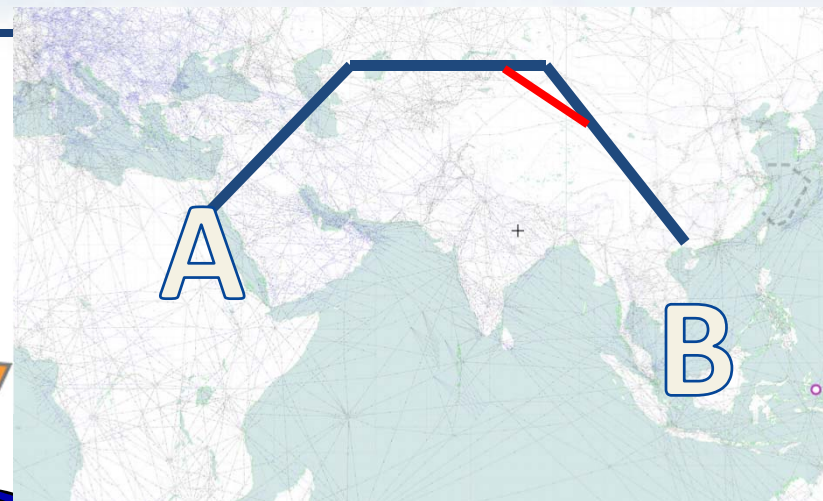
# Level 2 (Pre-tactical) CMAC Process



# Level 3 (Tactical) CMAC Process



# Question: Correct or not?



| Route Designator (RNP/RNAV Type)       | Route Usage Notes             |       |     |                 |                         |             |                 |  |   |  |
|--|-------------------------------|-------|-----|-----------------|-------------------------|-------------|-----------------|--|---|--|
| Significant Point Name (RNP/RNAV Type) | Significant Point Coordinates |       |     |                 |                         |             |                 |  |   |  |
|  | Track MAG                     | Dist  | COP | Upper limit     | Minimum flight altitude | Lower limit | FL series       | IFR cruising levels maximum                      | Controlling Unit Airspace Class/Remarks |  |
| <b>L18 (RNP/RNAV)</b>                  |                               |       |     |                 |                         |             |                 |  |   |  |
| 1. LANCN                               | 52255N 044222W                |       |     |                 |                         |             |                 |  | Westbound route entry. Exceeds 01.10.   |  |
| (RNAV 5)                               | 318°/130°                     | 20 nm |     | FL 245 / FL 195 | 10 nm                   | even        | FL 240 / FL 200 | Class C. London Control (M level) Freq. 133.600. |   |  |
| 2. BACDI                               | 52300N 044617W                |       |     |                 |                         |             |                 | Class C. ATS delegated to                        |   |  |
| (RNAV 5)                               | 318°/130°                     | 11 nm |     | FL 245 / FL 195 | 10 nm                   | even        | FL 240 / FL 160 | Class C. ATS delegated to                        |   |  |
| 3. ABLN                                | 52465N 044533W                |       |     |                 |                         |             |                 | Class C. ATS delegated to                        |   |  |
| (RNAV 5)                               | 318°/130°                     | 19 nm |     | FL 245 / FL 85  | 10 nm                   | even        | FL 240 / FL 100 | Class C. ATS delegated to                        |   |  |
| 4. (R)UM                               | 52344N 052239W                |       |     |                 |                         |             |                 | Class C. ATS delegated to                        |   |  |
| (RNAV 5)                               | 318°/130°                     | 6 nm  |     | FL 245 / FL 85  | 10 nm                   | even        | FL 240 / FL 60  | Class C. ATS delegated to                        |   |  |
| 5. LIPDO                               | 53030N 055000W                |       |     |                 |                         |             |                 | IFR Boundary For continuation inland.            |   |  |

**AIP**

**CDR3**



Describe the route (Fill ITEM15) with CDR3

# CDR1



Regard CDR1 as permanent, be careful with applicable date, time period and FL Published in AIP

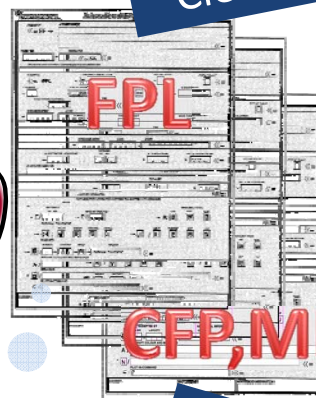
| Route Designator (RNP/RNAV Type)       |                | Route Usage Notes |     |                         |                    |                |                                       |                  |         |         |  |
|--|----------------|-------------------|-----|-------------------------|--------------------|----------------|---------------------------------------|------------------|---------|---------|--|
| Significant Point Name (RNP/RNAV Type) | Track MGRS JT  | Dist              | COP | Upper limit lower limit | Minimum height min | Lateral limits | FL series IFR cruising levels max/min | Controlling Unit |         | Remarks |  |
|  |                |                   |     |                         |                    |                |                                       | Class            | Remarks |         |  |
| <b>AIP</b>                             |                |                   |     |                         |                    |                |                                       |                  |         |         |  |
| L44 (RNP/RNAV)                         |                |                   |     |                         |                    |                |                                       |                  |         |         |  |
| L LANCN                                | 02252N 004222W |                   |     |                         |                    |                |                                       |                  |         |         | Unpublished route only. Extension of L16             |
| (RNAV S)                               | 2167 130       | 20 nm             |     | FL 245 / FL 100         | 10 nm              |                | even FL 245 / FL 200                  | Class: C         |         |         | London Control (Heathrow) (All Levels) Freq: 133.500 |
| L BACSI                                | 52305N 004417W |                   |     |                         |                    |                |                                       |                  |         |         | Class: C<br>ATS delegated to Dublin ATC              |
| (RNAV S)                               | 2167 130       | 11 nm             |     |                         |                    |                | even FL 245 / FL 100                  | Class: C         |         |         | ATS delegated to Dublin ATC                          |
| L ABLN                                 | 52465N 004533W |                   |     |                         |                    |                |                                       |                  |         |         | Class: C<br>ATS delegated to Dublin ATC              |
| (RNAV S)                               | 2167 130       | 19 nm             |     | FL 245 / FL 85          | 10 nm              |                | even FL 245 / FL 100                  | Class: C         |         |         | ATS delegated to Dublin ATC                          |
| L BKLM                                 | 52545N 005229W |                   |     |                         |                    |                |                                       |                  |         |         | Class: C<br>ATS delegated to Dublin ATC              |
| (RNAV S)                               | 2167 130       | 6 nm              |     | FL 245 / FL 55          | 10 nm              |                | even FL 245 / FL 80                   | Class: C         |         |         | ATS delegated to Dublin ATC                          |
| L LFGO                                 | 53030N 005300W |                   |     |                         |                    |                |                                       |                  |         |         | FIR Boundary<br>For continuation see AIP Ireland     |

**AIRROUTE**

**Dispatch Clearance List**



**MET INFO**



**AIRCRAFT**

**Flight Plan**



Describe the route (Fill ITEM15) with CDR1

# CDR2



Check NOTAM before operation, be careful with time period and FL provided by NOTAM

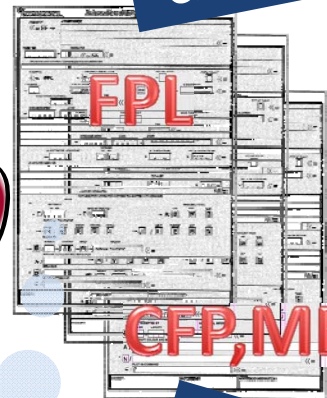
| Route Designator (RNP/RNAV Type)       | Route Usage Notes |                 |     |                         |                         |                |                                       |                  |         |  |
|--|-------------------|-----------------|-----|-------------------------|-------------------------|----------------|---------------------------------------|------------------|---------|--|
| Significant Point Name (RNP/RNAV Type) | Track MGRS JT     | Dist            | COP | Upper limit lower limit | Minimum flight altitude | Lateral limits | FL series IFR cruising levels max/min | Controlling Unit |         | Remarks  |
|  |                   |                 |     |                         |                         |                |                                       | Class            | Remarks |  |
| L14 (RNP/RNAV)                         |                   |                 |     |                         |                         |                |                                       |                  |         |  |
| L14                                    |                   |                 |     |                         |                         |                |                                       |                  |         |  |
| L14                                    | LONDON            | 02250N 004222W  |     |                         |                         |                |                                       |                  |         | Unpublished route only. Extension of L14.                      |
| (RNP)                                  | 2167              | 20 nm           |     |                         |                         |                | even FL 240 FL 200                    |                  |         | Class C. London Control (Heathrow) (All Levels) Prog. 133.000. |
| L14                                    | BACSI             | 52300N 004417W  |     |                         |                         |                | even FL 240 FL 180                    |                  |         | Class C. ATIS delegated to Dublin ATC.                         |
| (RNP)                                  | 2167              | 11 nm           |     |                         |                         |                | even FL 240 FL 180                    |                  |         | Class C. ATIS delegated to Dublin ATC.                         |
| L14                                    | ADLN              | 524650N 004333W |     |                         |                         |                | even FL 240 FL 180                    |                  |         | Class C. ATIS delegated to Dublin ATC.                         |
| (RNP)                                  | 2167              | 19 nm           |     |                         |                         |                | even FL 240 FL 180                    |                  |         | Class C. ATIS delegated to Dublin ATC.                         |
| L14                                    | DKLM              | 525840N 005229W |     |                         |                         |                | even FL 240 FL 180                    |                  |         | Class C. ATIS delegated to Dublin ATC.                         |
| (RNP)                                  | 2167              | 6 nm            |     |                         |                         |                | even FL 240 FL 180                    |                  |         | Class C. ATIS delegated to Dublin ATC.                         |
| L14                                    | LPGO              |                 |     |                         |                         |                |                                       |                  |         | IF Boundary or continuation see AIP and.                       |

AIRROUTE

Dispatch Clearance List



MET INFO



CFP, MEL....

AIRCRAFT

Describe the route (Fill ITEM15) with CDR2

Flight Plan



# CDR3

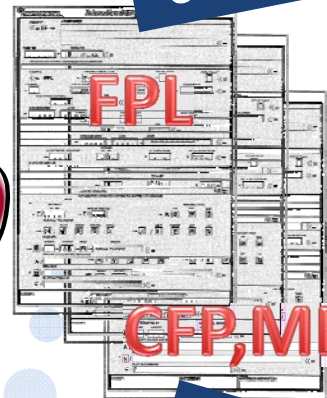


## AVAILABLE ROUTE

| Route Designator (RNP/RNAV Type)  |               | Route Usage Notes |     |                         |                         |                |                                       |                  |                |         |  |
|---|---------------|-------------------|-----|-------------------------|-------------------------|----------------|---------------------------------------|------------------|----------------|---------|--|
| RNP/RNAV Type   | Track MGRS JT | Dist              | COP | Upper limit lower limit | Minimum flight alt. MSL | Lateral limits | FL series IFR cruising levels max/min | Controlling Unit | Airspace Class | Remarks |  |
|   |               |                   |     |                         |                         |                |                                       |                  |                |         |  |
| <b>AIP</b>  |               |                   |     |                         |                         |                |                                       |                  |                |         |  |
| <p><b>L44</b> (RNP/RNAV)</p> <p>+ LANCN 022520N 0042221W</p> <p>(RNAV S) 2167 130° 20 nm even FL 240/ FL 200 Class C London Control (Heathrow) (All Levels) Prog. 133.000</p> <p>+ BACSI 523030N 0044617W</p> <p>(RNAV S) 2167 130° 11 nm FL 240/ FL 140 10 nm even FL 240/ FL 100 Class C ATIS delegated to Dublin ATIS</p> <p>+ ABLIN 524650N 0043939W</p> <p>(RNAV S) 2167 130° 19 nm FL 240/ FL 80 10 nm even FL 240/ FL 100 Class C ATIS delegated to Dublin ATIS</p> <p>+ BKULM 525140N 0052259W</p> <p>(RNAV S) 2167 130° 6 nm FL 240/ FL 50 10 nm even FL 240/ FL 50 Class C ATIS delegated to Dublin ATIS</p> <p>+ LPIGO 530300N 0053000W</p> <p>(RNAV S) 2167 130° 10 nm FL 240/ FL 50 10 nm even FL 240/ FL 50 Class C ATIS delegated to Dublin ATIS</p> |               |                   |     |                         |                         |                |                                       |                  |                |         |  |



Check AIP for available route



CFP, MEL....



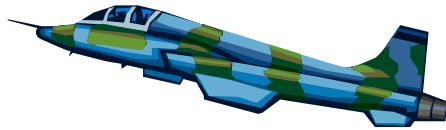
Describe the route (Fill ITEM15) with permanent route





# ASM AND CONSISTENCY IN ATM

# PRINCIPILES



- Coordination between civil and military authorities should be carried out at the strategic, pre-tactical and tactical levels
- Consistency between ASM, ATFM and ATS should be established and maintained at three levels of ASM



# Civil/military coordination and three levels ASM



**Strategic Level 1** – Establishment of pre-determined airspace structures; CMAC and ASM procedures; Cross-border coordination and Separation Standards

National CMAC Body  
(Committee)

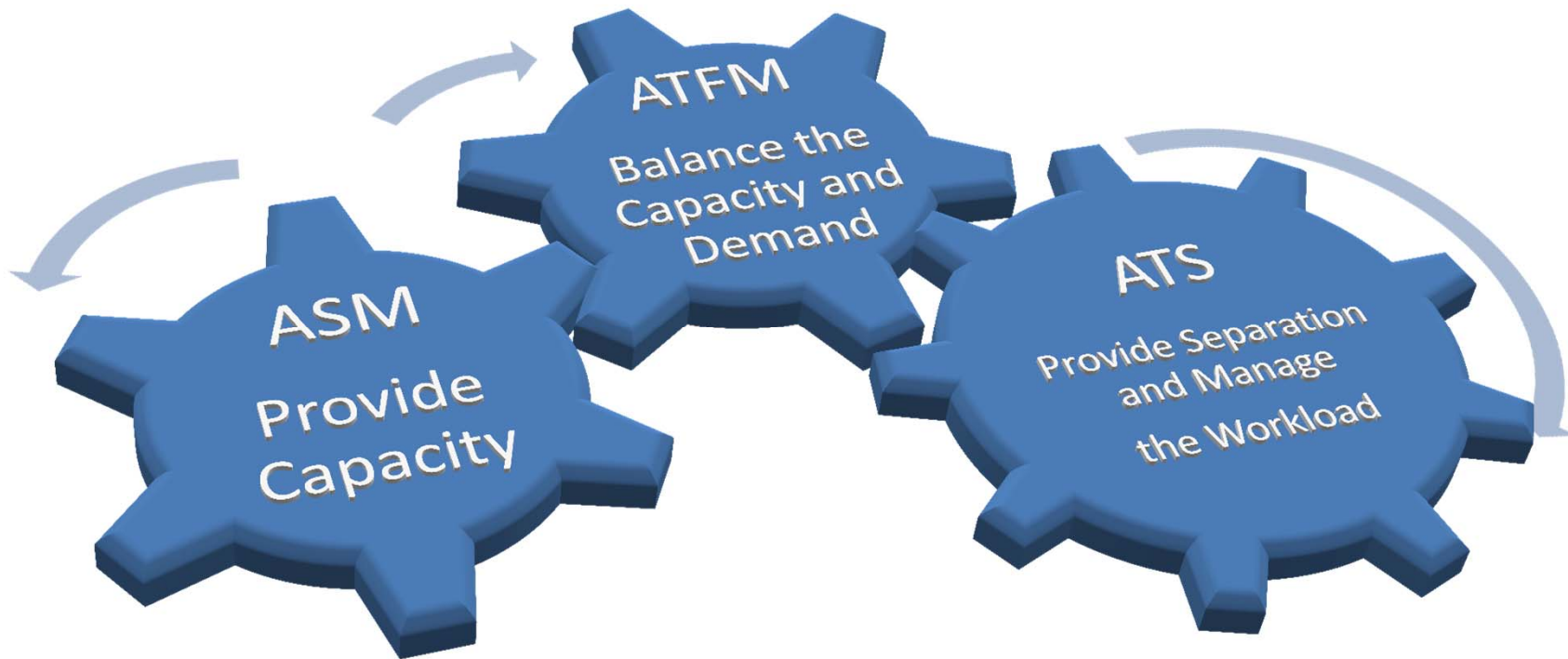
**Pre-tactical Level 2** – Day-to-day allocation of airspace according to the conditions and procedures agreed upon at level 1

ASM Entity  
(Joint Cell)

**Tactical Level 3** — Real-time use of airspace : activation, de-activation, real-time reallocation of airspace

ATS Units and  
Controlling Military  
Units

# Interoperate of ASM/ATFM/ATS



# ATFM Operational Management

Demand

Capacity

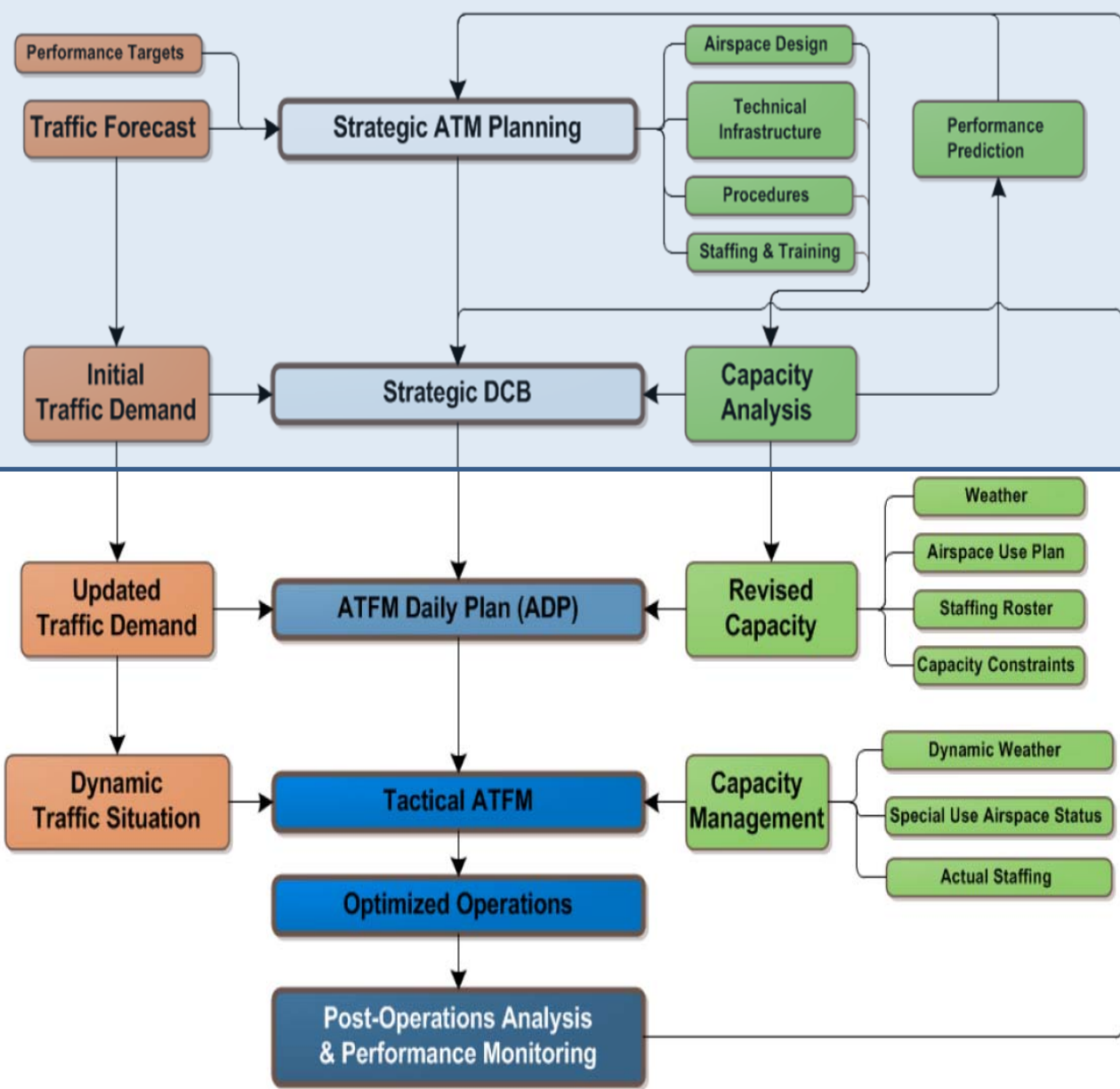
ATM Planning

Strategic

Pre-Tactical

Tactical

Post-Operations



- Review and re-assess airspace structure
- establish new flexible airspace structures
- Design airspace under FUA concept
- Optimize CMAC process

# ATFM Operational Management

Demand

Capacity

ATM Planning

Performance Targets  
Traffic Forecast

Strategic ATM Planning

Airspace Design  
Technical Infrastructure  
Procedures  
Staffing & Training

Performance Prediction

Strategic

Initial Traffic Demand

Strategic DCB

Capacity Analysis

Pre-Tactical

Updated Traffic Demand

ATFM Daily Plan (ADP)

Revised Capacity

Weather  
Airspace Use Plan  
Staffing Roster  
Capacity Constraints

CDR1/ATS Route  
CDR2 Availability  
TSA/TRA/CBA  
Availability

Tactical

Dynamic Traffic Situation

Tactical ATFM

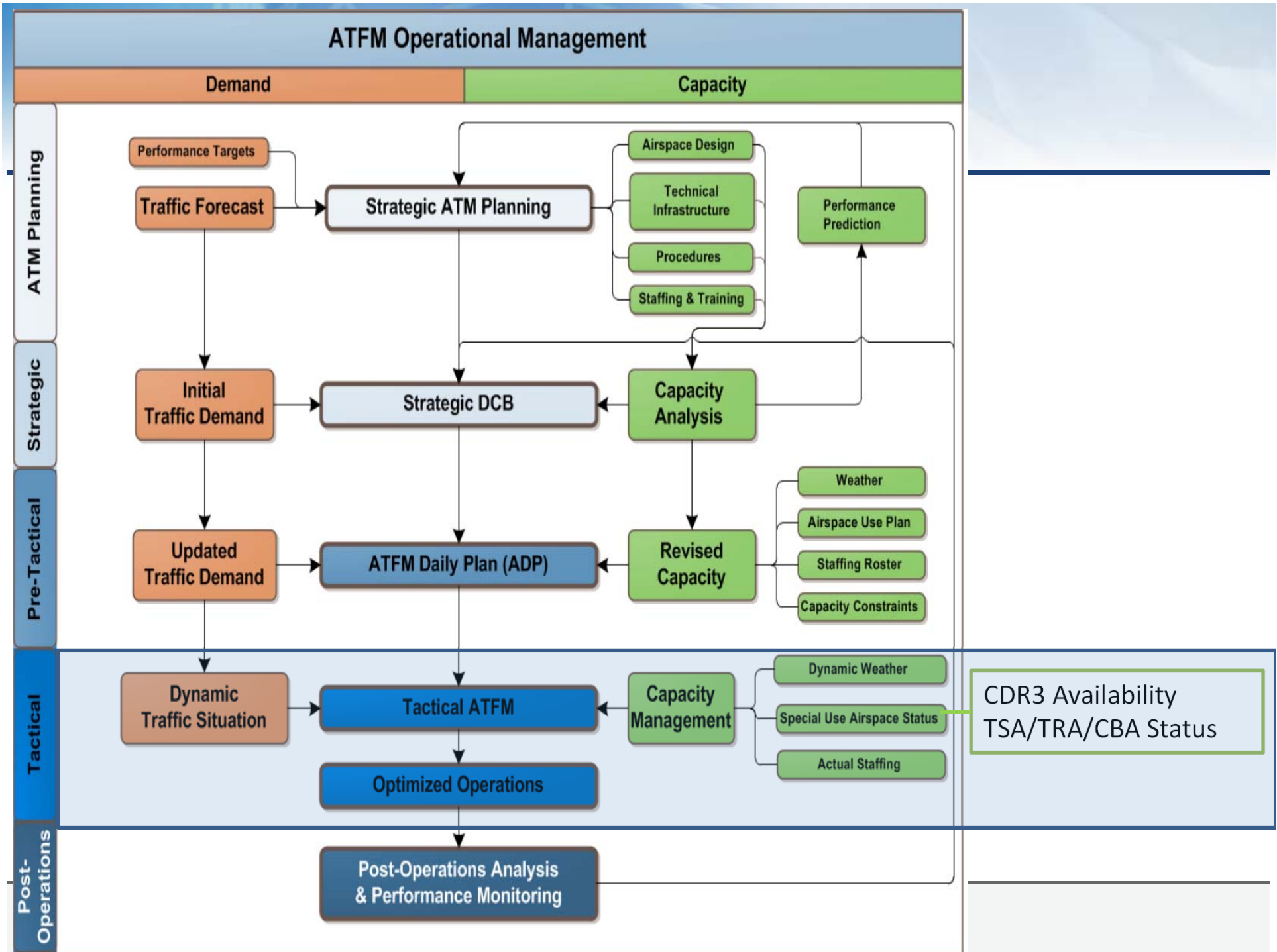
Capacity Management

Dynamic Weather  
Special Use Airspace Status  
Actual Staffing

Optimized Operations

Post-Operations

Post-Operations Analysis & Performance Monitoring

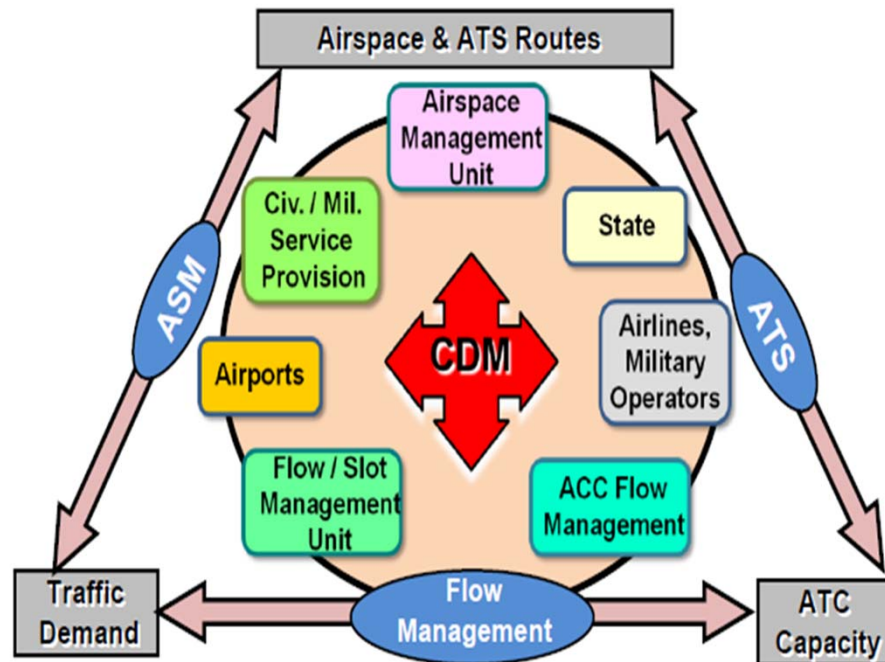


# COLLABORATIVE DECISION MAKING (CDM)

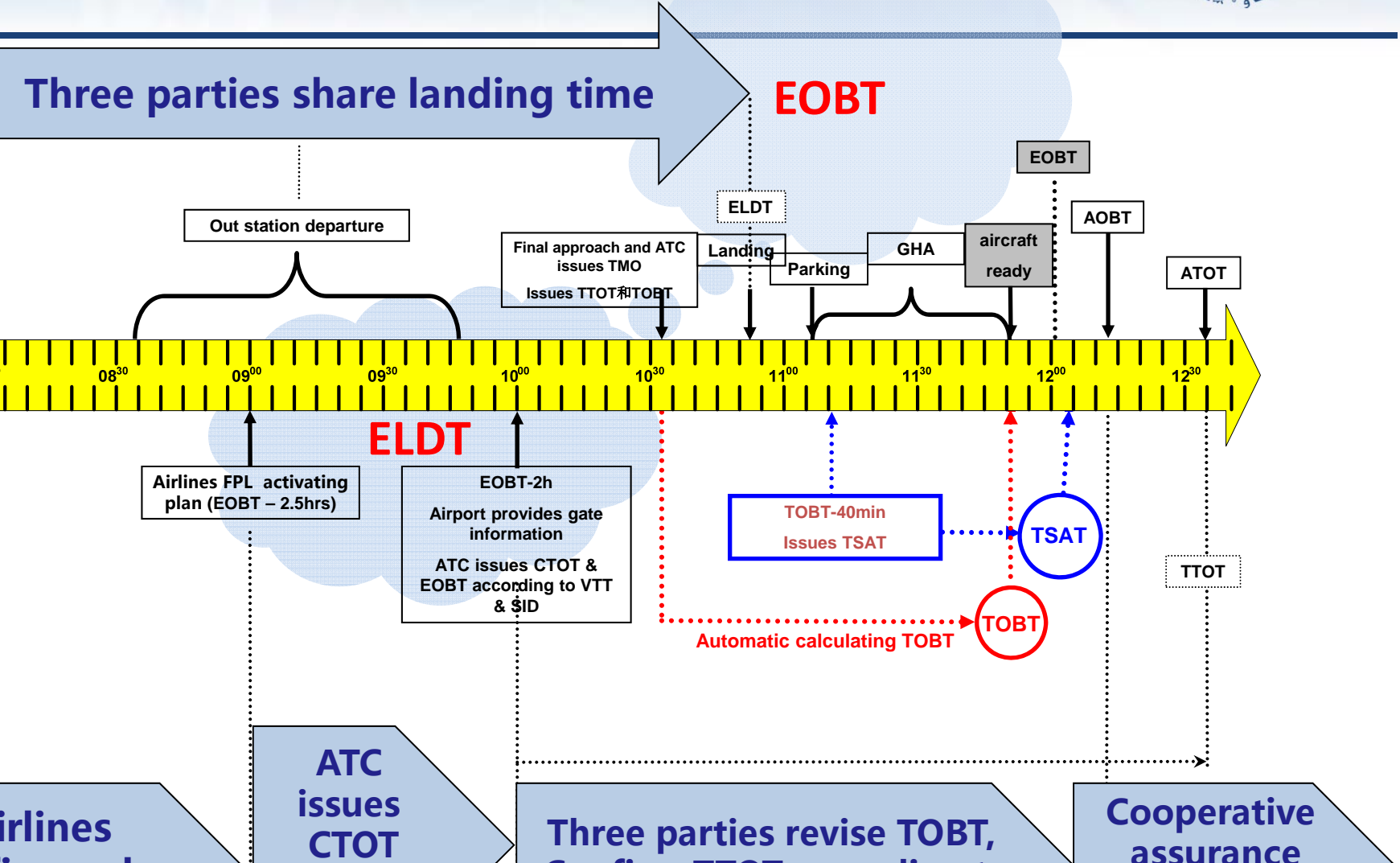


## CDM

- A tool to support ASM
- Base
  - Information exchange and data sharing
- Process
  - Brings together airlines, airports, civil and military aviation authorities
  - Facilitate decision-making



# Operational Process of A-CDM Operations





**Thank You**