



ICAO BEIJING RSO UNITING AVIATION

NO COUNTRY
LEFT BEHIND



Civil/Military Cooperation and Flexible Use of Airspace

LIU Song
Regional Officer ATM

Beijing / May 12, 2016



Outline

- Airspace Management/Flexible Use of Airspace (ASM/FUA) Concept
- FUA Implementation Basic Prerequisites and 3 Levels ASM
- Flexible and Adaptable Airspace Structure
- CMAC/FUA Related ASBU Modules and Regional Implementation Priorities



ICAO BEIJING RSO

UNITING AVIATION

NO COUNTRY
LEFT BEHIND



ASM/FUA CONCEPT





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

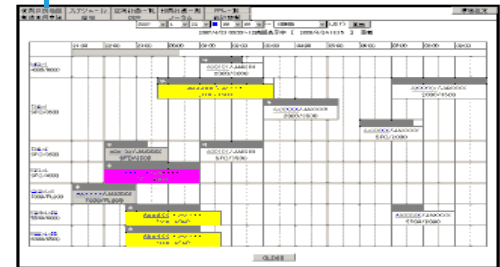
- Airspace use should be coordinated and monitored in order to accommodate the conflicting requirements of all users and to **minimize any constraints** on operations;
- Airspace reservations should be planned in advance with changes made **dynamically** whenever possible. The system also needs to accommodate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





How to understand the keywords in the principles

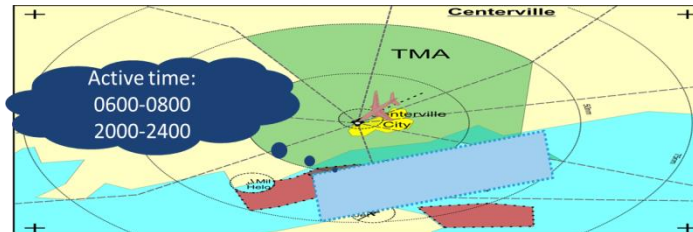
- “Dynamic and Flexible”
 - Plan-Review airspace periodically
 - Pre-coordinate and allocate airspace on day to day basis
 - Re-allocate airspace based on real time coordination
 - Locate airspace according to the traffic pattern
 - Accommodate short-notice unplanned requirements





How to understand the keyword in the principles

- “Minimize”
 - Lateral and vertical limits are the minimum required to **safely contain** the activity therein
 - Released as soon as activity completes with timely notice to other airspace users
 - Activated according to the schedule of the activity with appropriate advanced warning for other airspace users





WHAT IS FUA?

- An airspace management concept
- A methodology of capacity management
 - Long Term-Design and organize the airspace structure using the concept of FUA
 - Near Term-Coordinate and allocate the airspace using the concept of FUA





User Requirements Driven—Allocated according to user requirements, not “owed” by civil or military

Segregated Temporarily—Any necessary airspace segregation is temporary, based on actual use of airspace within a specific time period.



Managed Dynamically—Managed and used flexibly on a day-to-day basis.

Continuum —Contiguous volumes of airspace are not constrained by national boundaries.



Why we need FUA?

- “Win-Win” result: Allow temporary access for civilian(military) users to military(civil) restricted and reserved airspace
 - Civil: Achieve optimized operation
 - Airlines – Less cost (less distance, time , fuel, delay) ,More money
 - ATC – Less workload (simplifying operation, equalizing traffic distribution), More capacity(enhanced ATS route network) and associated sectorisation
 - Military : Achieve flexibility without compromising the priority
 - Better respond to specific military requirements and Better for military to fulfill the mission





ICAO BEIJING RSO

UNITING AVIATION

NO COUNTRY
LEFT BEHIND



FUA PREREQUISITES AND 3 LEVELS ASM





- 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



Civil/Military Coordination at 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)

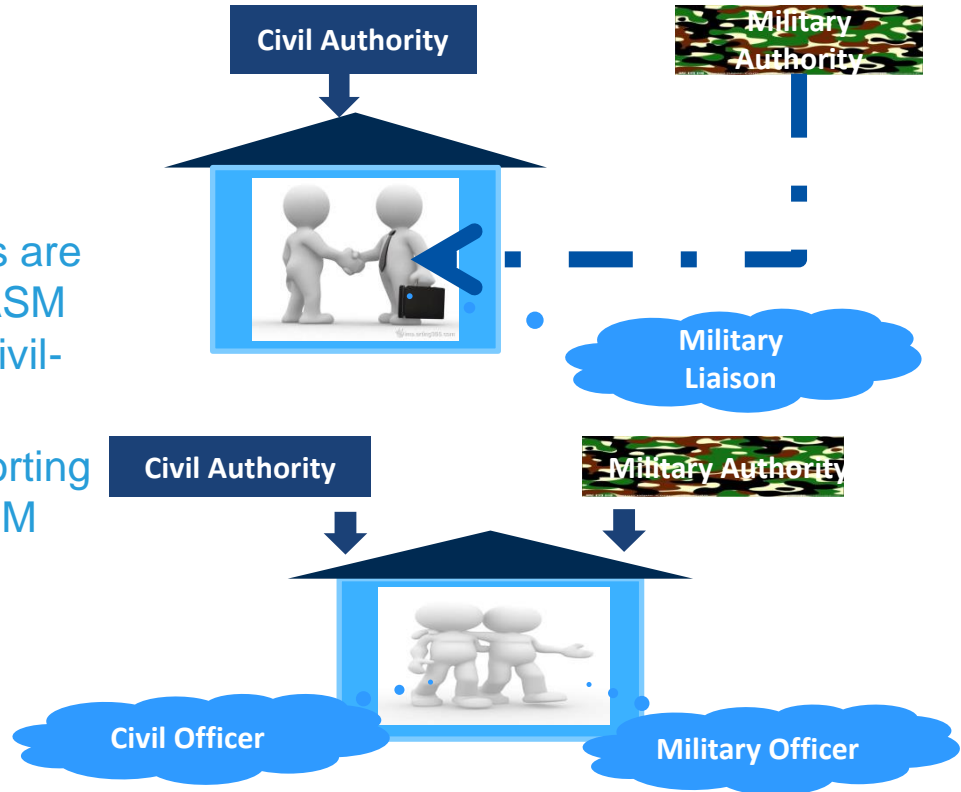
Tactical Level 3 – Real-time use of airspace : activation, de-activation, real-time reallocation of airspace

ATS Units and Controlling
Military Units



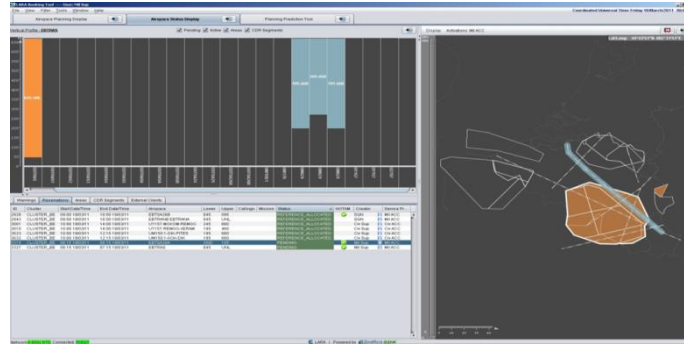
• ASM Entity

- States should establish ASM Entity to conduct Level2 ASM
- Where both Civil and Military authorities are responsible for airspace management, ASM entity should take the form of a joint Civil-Military Cell
- States should provide adequate supporting systems to ensure a timely and efficient ASM process

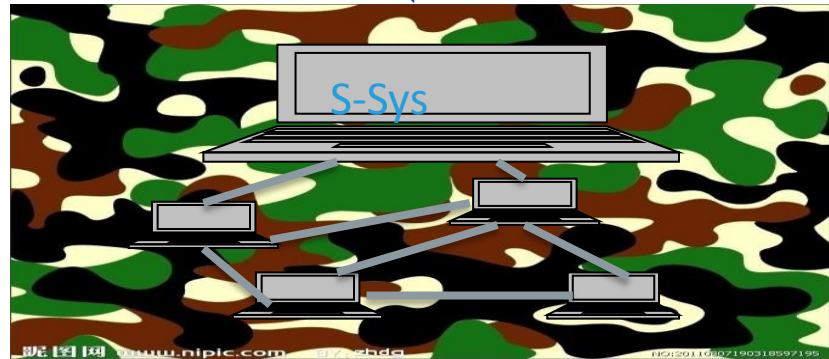
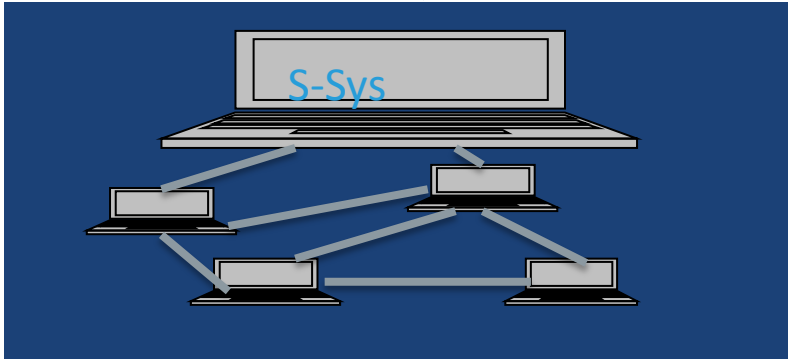




Mutual Visibility
Mutual Understanding
Efficient CDM Process



C/M Requirements
Common Situation
Airspace Allocation





ICAO BEIJING RSO

UNITING AVIATION

NO COUNTRY
LEFT BEHIND

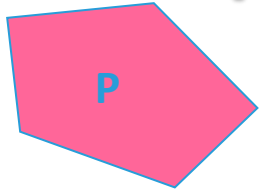


FLEXIBLE AIRSPACE STRUCTURE

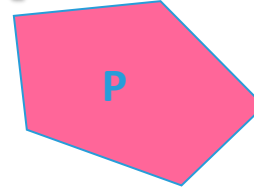




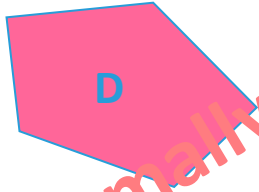
Non-FUA VS. FUA



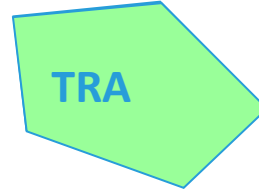
PROHIBITED



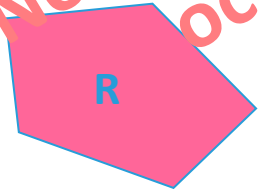
PROHIBITED



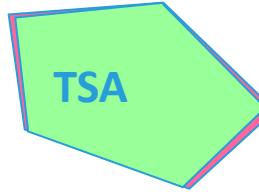
DANGER



CROSSING POSSIBLE
WHEN ACTIVE / RELEASED
AS SOON AS ACTIVITY
STOPS



RESTRICTED



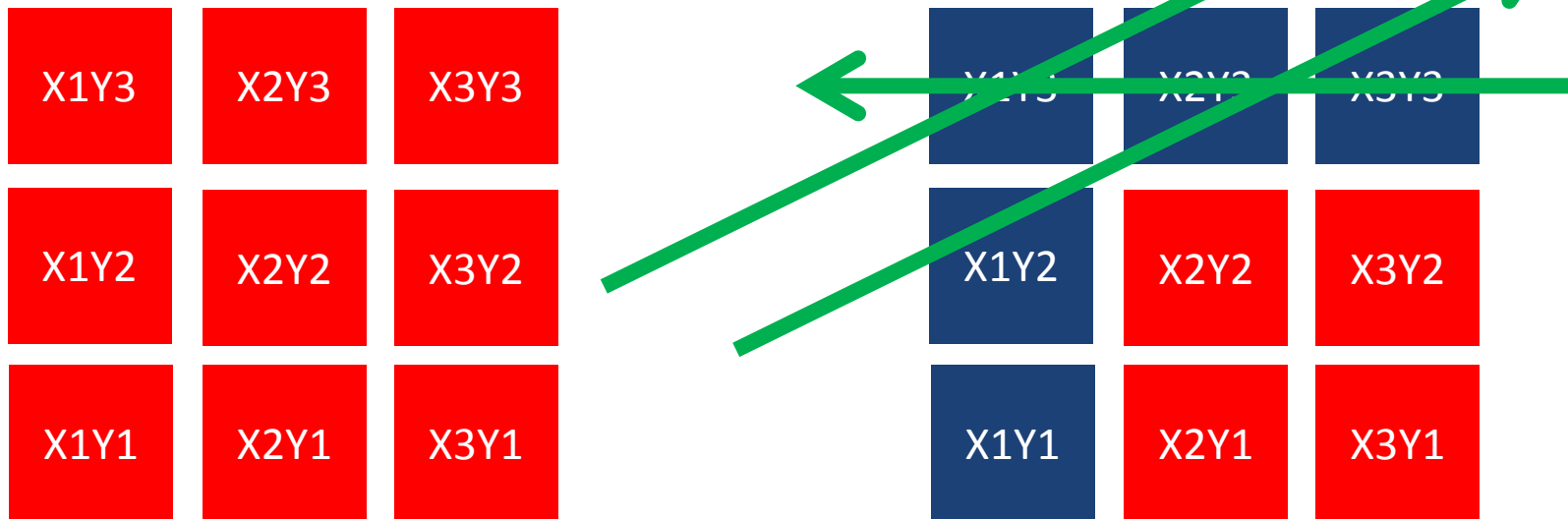
RELEASED AS SOON AS
ACTIVITY STOPS

*Normally published as
occupied H24*



FLEXIBLE AIRSPACE STRUCTURE

- Flexible airspace structures are suited to temporary allocation and utilization





FLEXIBLE AIRSPACE STRUCTURE

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



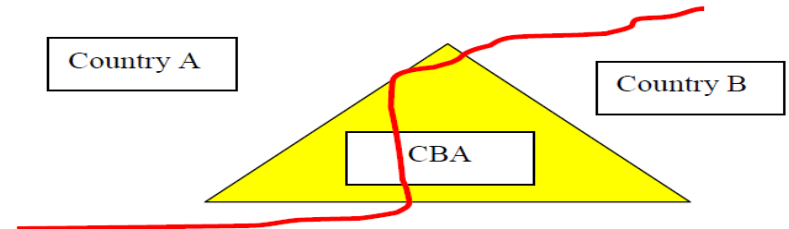


Temporary Reserved Area (TRA).	Temporary Segregated Airspace (TSA).
Temporarily reserved and allocated for the specific use of a particular user	Temporarily segregated and allocated for the exclusive use of a particular user
During a determined period of time	During a determined period of time
Other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



CBA

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





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

- Day to Day coordinated and allocated to respond to ATC capacity imbalance
- Plannable only in accordance with NOTAM
- Part of pre-defined routing scenario

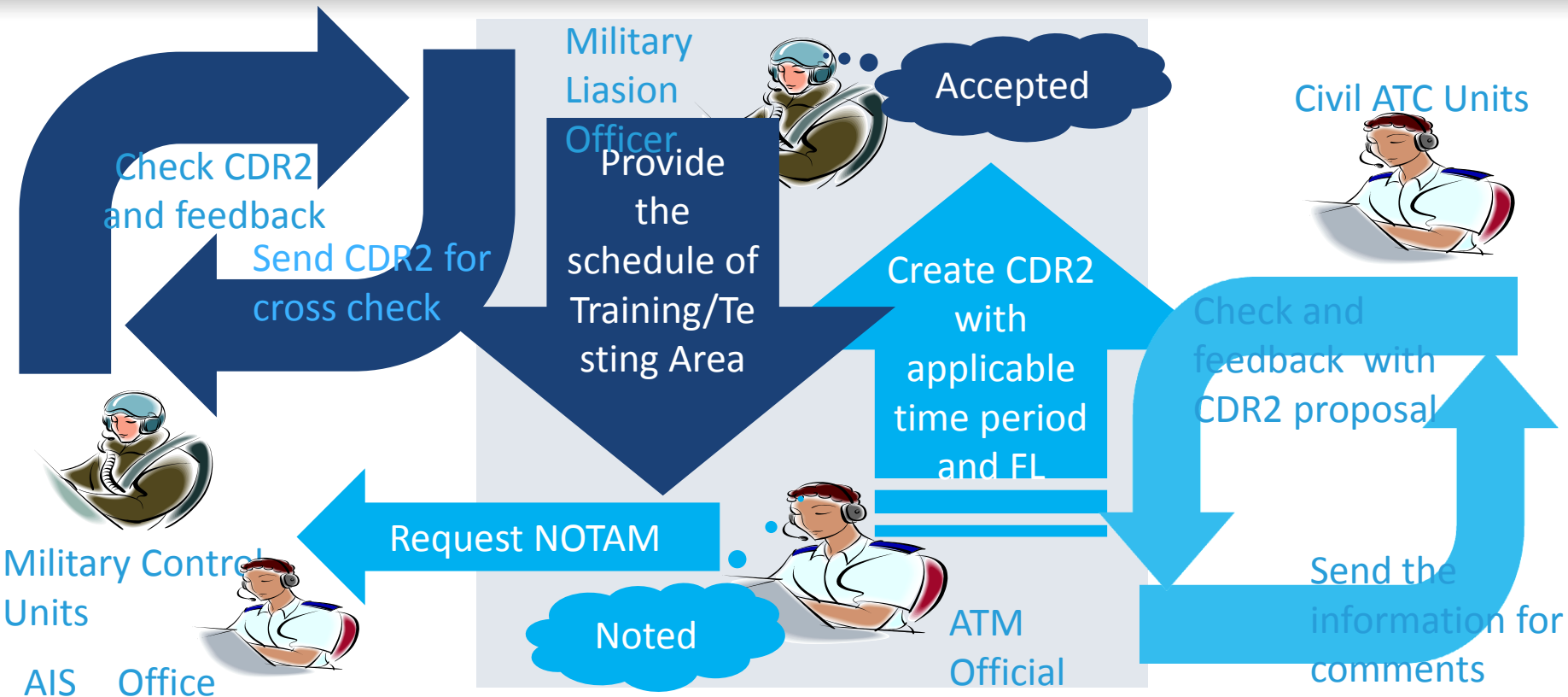
CDR3

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



- CDR Definition
 - A non-permanent ATS route or portion thereof which can be planned and used under specified conditions.
- CDR Category
 - CDR can be divided into 3 Categories







CMAC/FUA RELATED ASBU MODULES AND REGIONAL IMPLEMENTATION PRIORITIES





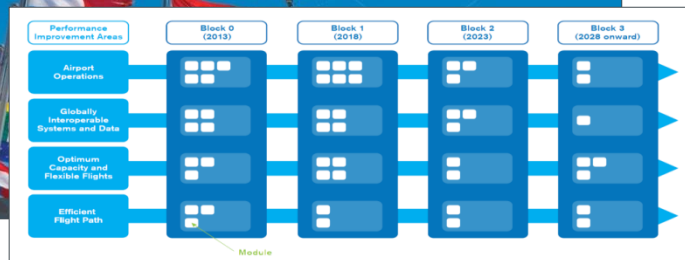
ICAO and GANP

STRATEGIC OBJECTIVE ②



ICAO

CAPACITY AND EFFICIENCY

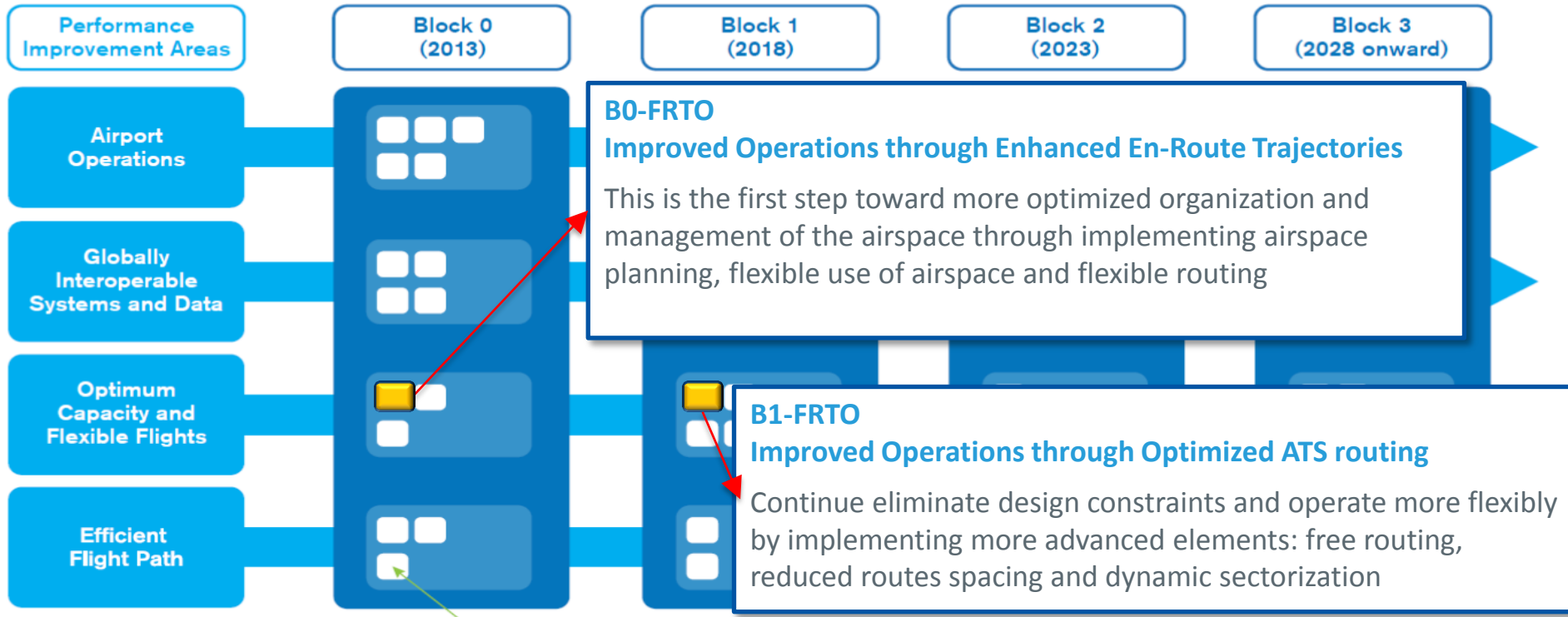
2013–2028
Global Air Navigation Plan

“Increase the capacity and improve the efficiency of the global civil aviation system”

- Through the GANP, offer a long-term vision to assist all aviation stakeholders, and ensure continuity and harmonization among modernization programmes
- Through the Aviation System Block Upgrades (ASBU), provide a consensus-driven modernization strategy for integrated planning

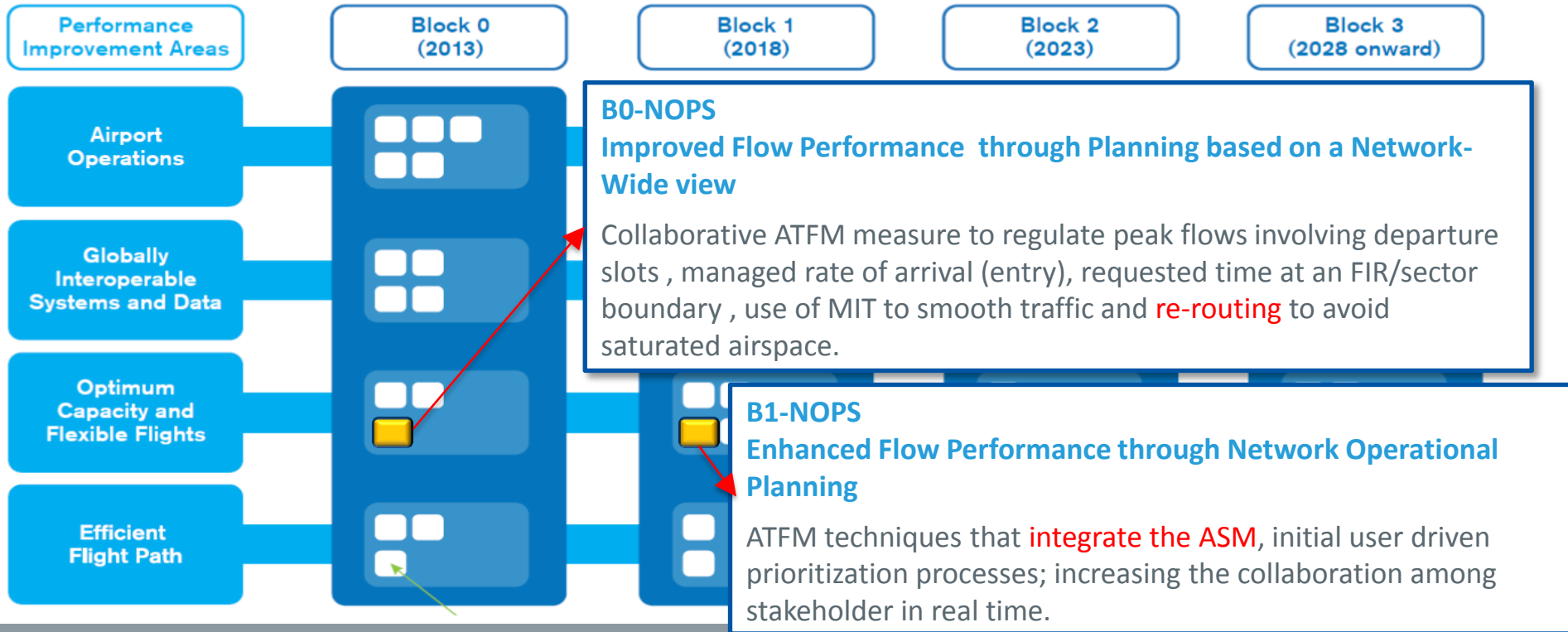


FUA-related Modules and Threads



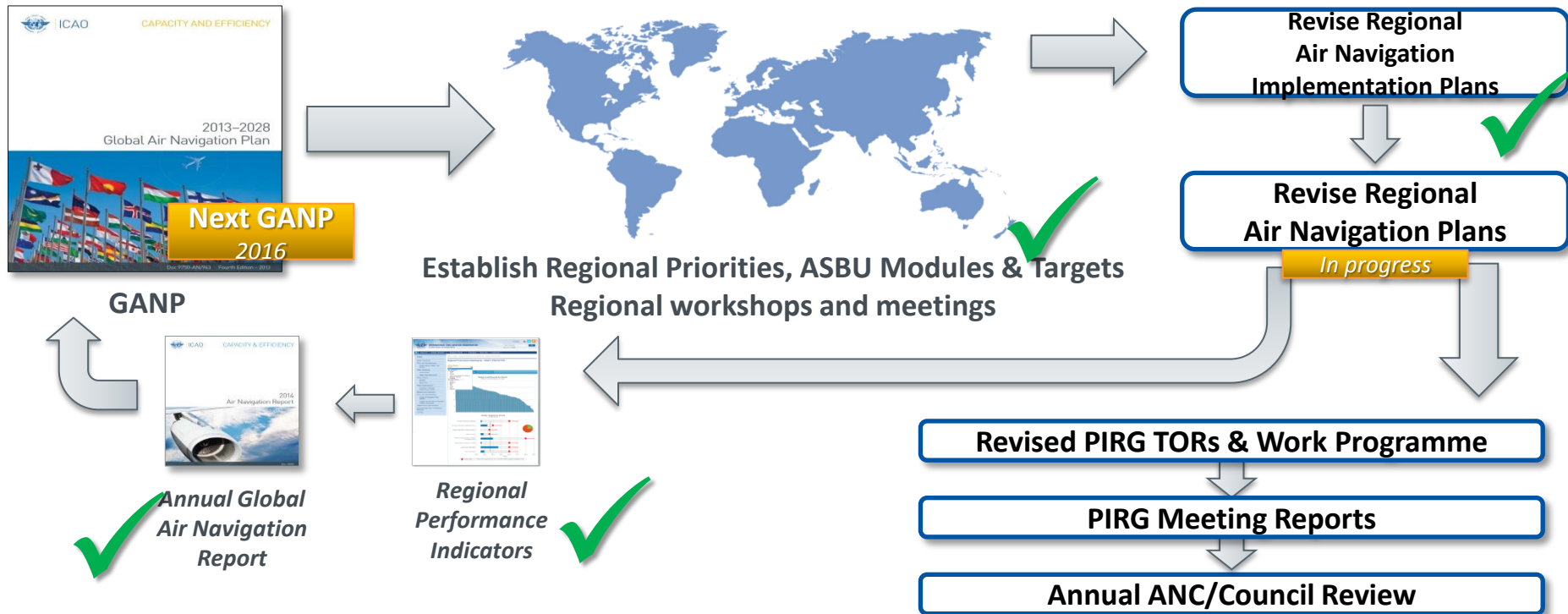


Other Modules and Threads involving FUA





Regional Implementation





APAC Priorities-CMAC and FUA

5. Civil/Military-Enhanced En-route Trajectories: All States Should ensure that SUA are regularly reviewed by the appropriate Airspace Authority to assess the effect on civil air traffic and the activities affecting the airspace

12 Nov.2015

B0-FRTO

% of States in which FUA is implemented

Proposed Regional Priorities and Targets as agreed on 16-01-14 by Chairpersons of APANPIRG SGs	Target date (Seamless ATM Phase 1 Plan)	Respective B0 module /Regional item	Indicators (measure progress against the target)
1. PBN: Where practicable, all high density aerodromes with instrument runways serving aeroplanes should have precision approaches or APV or LNAV.	12 November 2015	B0-APTA	% of high density aerodromes with precision approaches or APV or LNAV.
2. Network Operations: All High Density FIRs supporting the busiest Asia/Pacific traffic flows and high density aerodromes should implement ATFM incorporating CDM using operational ATFM platform/s.	12 November 2015	B0-NOPS	% of High Density FIRs supporting the busiest Asia/Pacific traffic flows and high density aerodromes using operational ATFM platforms incorporating CDM
3. Aeronautical Information Management: ATM systems should be supported by digitally-based AIM systems through implementation of Phase 1 and 2 of the AIS-AIM Roadmap	12 November 2015	B0-DATM	% of Phase 1 and 2 AIS-AIM elements completed
4. Flight and Flow Information for a Collaborative Environment: All States between ATC units where transfers of control are conducted have implemented the messages AIB, EST, ACN, TOC, AOC as far as practicable.	12 November 2015	B0-FICE	% of FIRs within which all applicable ACCs have implemented at least one interface to use AIOC / OLDI with neighbouring ACCs
5. Civil/Military- Enhanced En-Route Trajectories: All States should ensure that SUA are regularly reviewed by the appropriate Airspace Authority to assess the effect on civil air traffic and the activities affecting the airspace.	12 November 2015	B0-FRTO	% of States in which FUA is implemented



APAC Priorities-CMAC and FUA

Proposed Regional Priorities and Targets as agreed on 16-01-14 by Chairpersons of APANPRG SGs	Target date (Seamless ATM Phase 1 Plan)	Respective BO module /Regional Form	Indicators (measure progress against the target)
6. Civil/Military-Enhanced En-Route Trajectories: All States should ensure that a national civil/military body coordinating strategic civil-military activities is established.	12 November 2015	Strategic Civil Military Coordination (Regional)	% of States which have established a national civil/military body that performs strategic civil-military coordination
7. Civil/Military-Enhanced En-Route Trajectories: All States should ensure that formal civil military liaison for tactical response is established.	12 November 2015	Tactical Civil Military Coordination (Regional)	% of States which have established a formal civil military liaison for tactical response
8. Ground Surveillance: All Category 5 upper controlled airspace and Category 1 airspace supporting high density aerodromes should be designated as non-exclusive or exclusive as appropriate. ADS-B airspace requiring operation of ADS-B.	12 November 2015	BO-ASUR	% of Rats where Category 5 airspace and category 1 airspace supporting high density aerodromes are designated as ADS-B airspace
9. Ground Surveillance: ADS-B or MLAT or radar surveillance systems should be used to provide coverage of all Category 5 upper controlled airspace insofar as practicable, with data integrated into a national ATC aircraft situation display.	12 November 2015	BO-ASUR	% of ACCs with ADS Surveillance using ADS-B, MLAT or radar in Category 5 airspace, and having data integrated into the ATC system situation display
10. Trajectory-Based Operations-Data Link En-Route: Within Category B airspace ADS-C surveillance and CPDLC should be enabled to support PBN-based separations.	12 November 2015	BO-TBC	

6. Civil/Military-Enhanced En-route Trajectories: All States should ensure that a national civil/military body coordinating strategic civil-military activities is established

12 Nov. 2015

Strategic Civil Military Coordination (Regional)

% of States which have established a national civil/military body that performs strategic civil-military coordination

7. Civil/Military-Enhanced En-route Trajectories: All States Should ensure that formal civil military liaison for tactical response is established

12 Nov. 2015

Strategic Civil Military Coordination (Regional)

% of States which have established a formal civil military liaison for tactical response



APAC Seamless ATM plan

- Civil/Military Airspace Expectations

- **SUA should only be established after due consideration** of its effect on civil air traffic by the appropriate Airspace Authority to ensure it will be:
 - used for the purpose that it is established;
 - used regularly;
 - as small as possible, including **any internal buffers**, required to contain the activity therein;
 - if applicable, operated in accordance with FUA principles ; and
 - activated only when it is being utilised; and

Military SUA

International SUA





APAC Seamless ATM plan

- Civil/Military Airspace Expectations

- **SUA should be regularly reviewed** to ensure the activities that affect the airspace, and size and timing of such activity are accurately reflected by the SUA type, dimensions, activation notice and duration of activation.

Note:1.The review of airspace should be conducted by an airspace authority independent or a collaboration of civil and military airspace users.

A green, 3D-style hexagonal graphic with a white border and a slight shadow, containing the text 'SUA Review' in white. It is positioned over a background of airport navigation lights.

SUA Review



APAC Seamless ATM plan

- Civil/Military ATM expectations

Strategic Liaison

- **a national civil/military body** should be formed to coordinate strategic civil-military activities(military training should be conducted in locations and/or at times that do not adversely affect civilian operations, particularly those associated with major aerodromes);
- **formal civil-military liaison** should take place for tactical responses by encouraging military participation at civil ATM meetings and within ATC Centres;

Tactical Liaison





APAC Seamless ATM plan

- Civil/Military ATM expectations
 - **integration of civil and military ATM systems** using joint procurement, and sharing of ATS surveillance data (especially from ADS-B systems) should be provided as far as practicable;

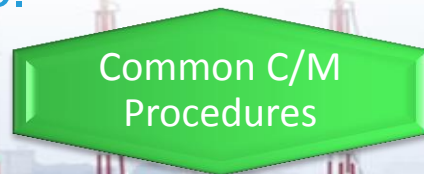




APAC Seamless ATM plan

- Civil/Military ATM expectations

- joint provision of civil/military navigation aids should be encouraged;
- common training should be conducted between civil and military ATM units in areas of common interest; and
- civil and military ATM units should utilize common procedures as far as practicable.





ICAO BEIJING RSO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



ICAO

North American
Central American
and Caribbean
(NACC) Office
Mexico City

South American
(SAM) Office
Lima

ICAO
Headquarters
Montréal

Western and
Central African
(WACAF) Office
Dakar

European and
North Atlantic
(EUR/NAT) Office
Paris

Middle East
(MID) Office
Cairo

Eastern and
Southern African
(ESAF) Office
Nairobi

Asia and Pacific
(APAC) Sub-office
Beijing

Asia and Pacific
(APAC) Office
Bangkok



THANK YOU