



INTERNATIONAL CIVIL AVIATION ORGANIZATION

A United Nations Specialized Agency

PBN Navigation Specification & TMA Design

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RO ATM/SAR

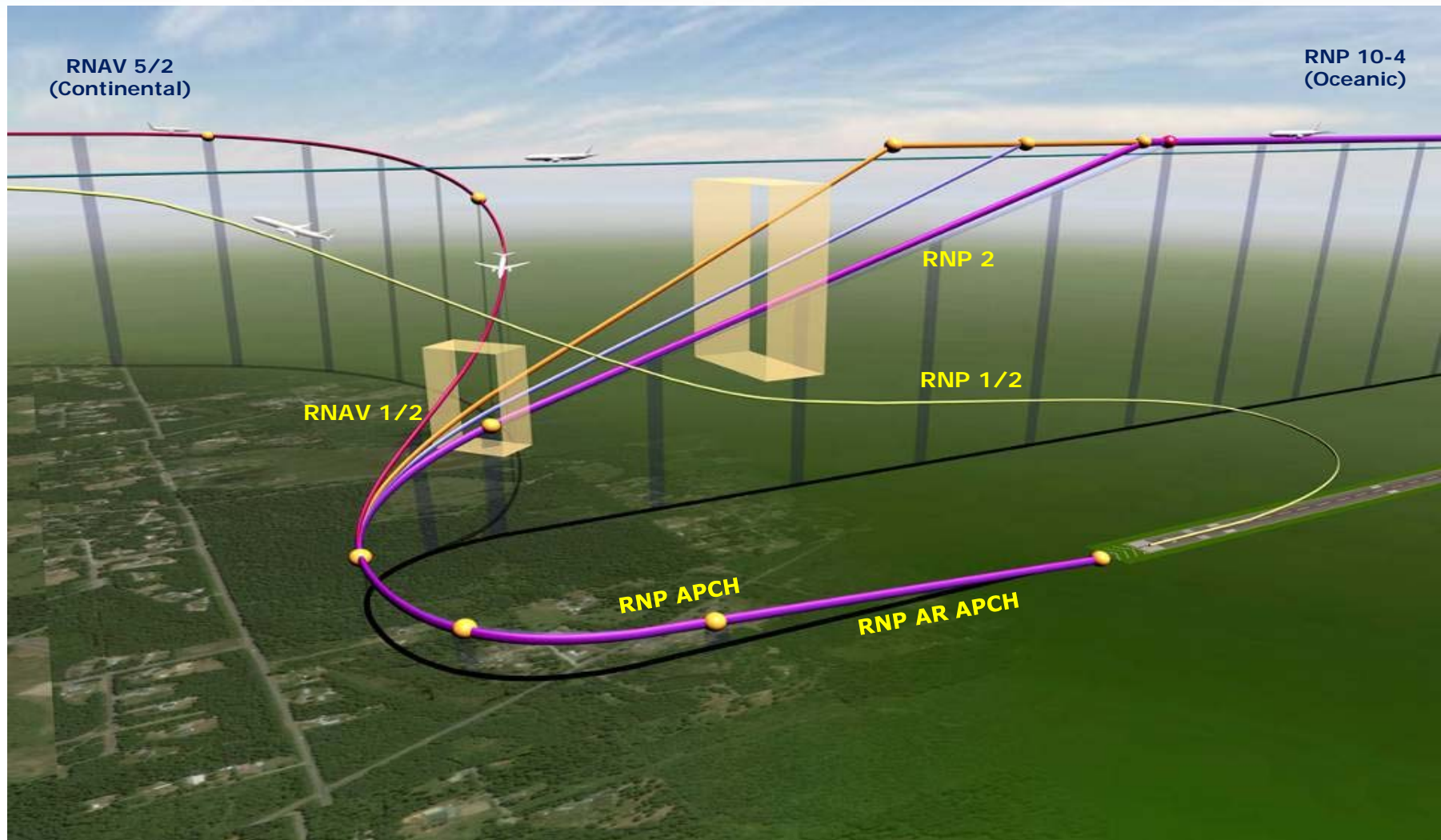


Navigation Specification, Flight Phase

8. The RNP 0.3 specification is primarily intended for helicopter operations.

Navigation Specification	Flight phase							
	En-route oceanic/remote	En-route Continental	Arrival	Approach			Missed ¹	Departure
				Initial	Intermediate	Final		
RNAV 10	10							
RNAV 5 ²		5	5					
RNAV 2		2	2					2
RNAV 1		1	1	1	1		1	1
RNP 4	4							
RNP 2	2	2						
RNP 1 ³			1	1	1		1	1
Advanced RNP ⁴	2 ⁵	2 or 1	1	1	1	0.3	1	1
RNP APCH ⁶				1	1	0.3 ⁷	1	
RNP AR APCH				1-0.1	1-0.1	0.3-0.1	1-0.1	
RNP 0.3 ⁸		0.3	0.3	0.3	0.3		0.3	0.3

PBN Airspace Concept



OBJECTIVE

Methodology STEPS

This module will provide an good understanding of Airspace volumes and Sectorisation in support of Air traffic Management

Three GOLDEN RULES



Methodology STEPS

Airspace Volumes protect the IFR Flight paths. They are Designed AFTER the routes have been designed.

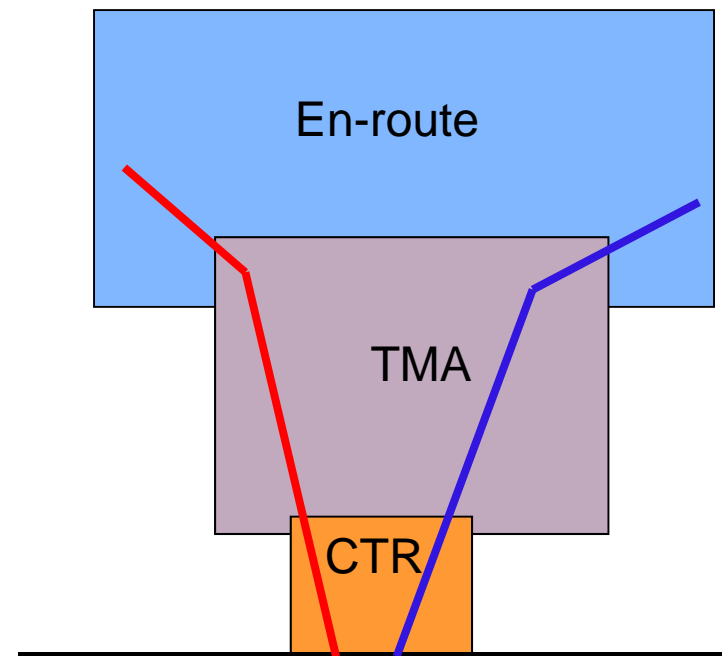
Routes should not be designed so as to fit into pre-existing Airspace Volumes.

Only delineate as much airspace volume as needed.

TMA

Terminal control area

A control area normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes.



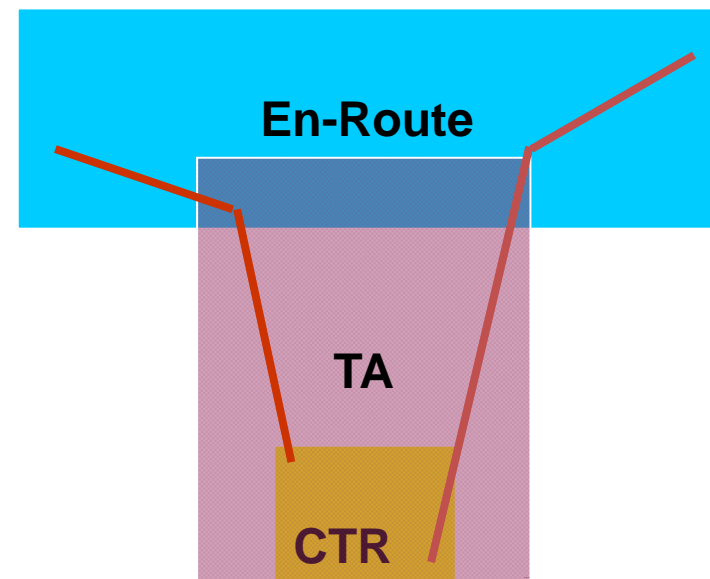
TMA



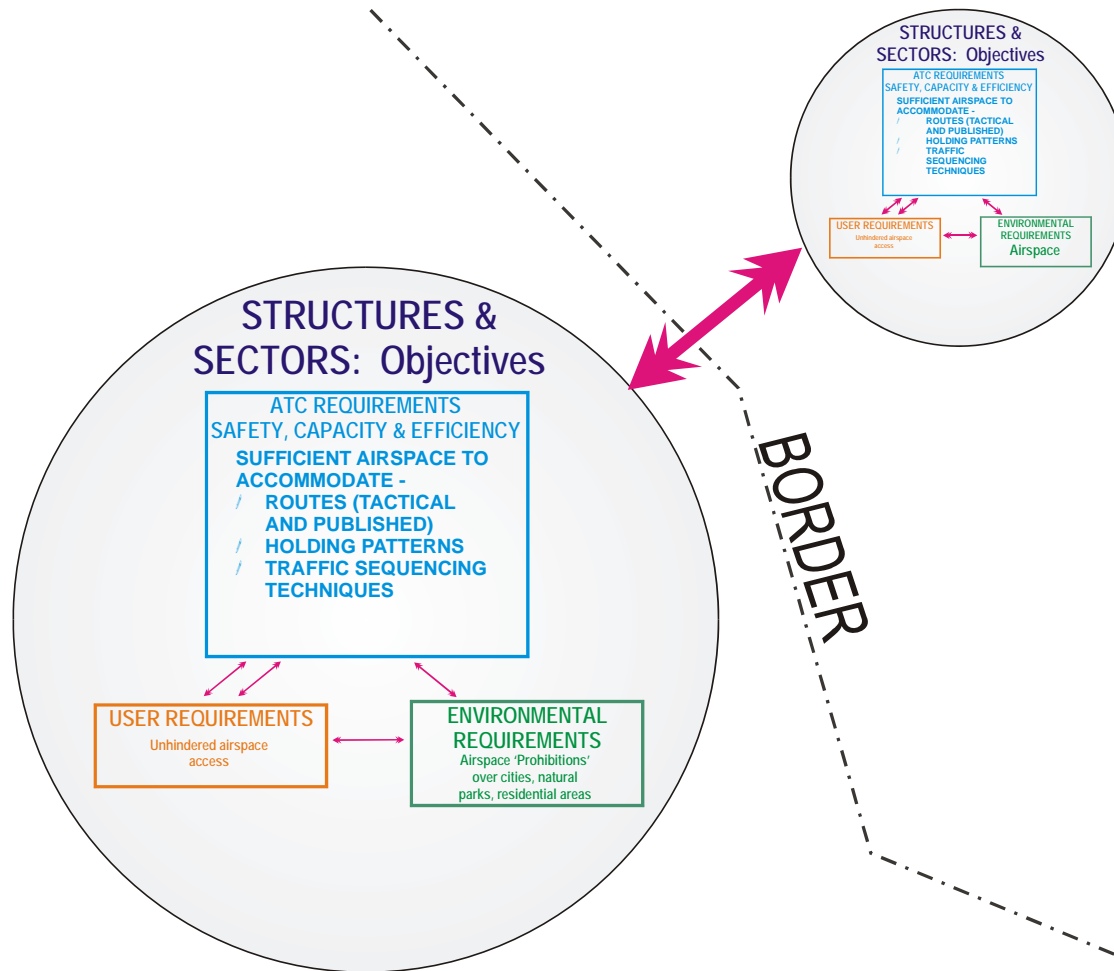
TMA - Terminal area surrounds an airport, and it is an airspace within which air traffic control service is provided.

Such airspace predominantly contains traffic operating along Terminal Routes.

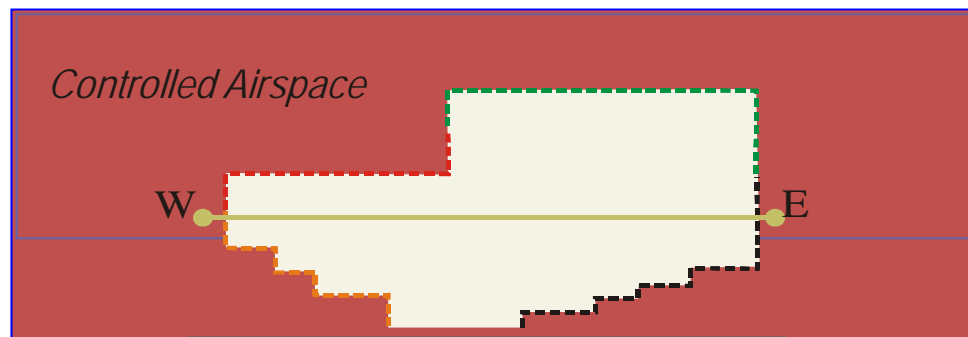
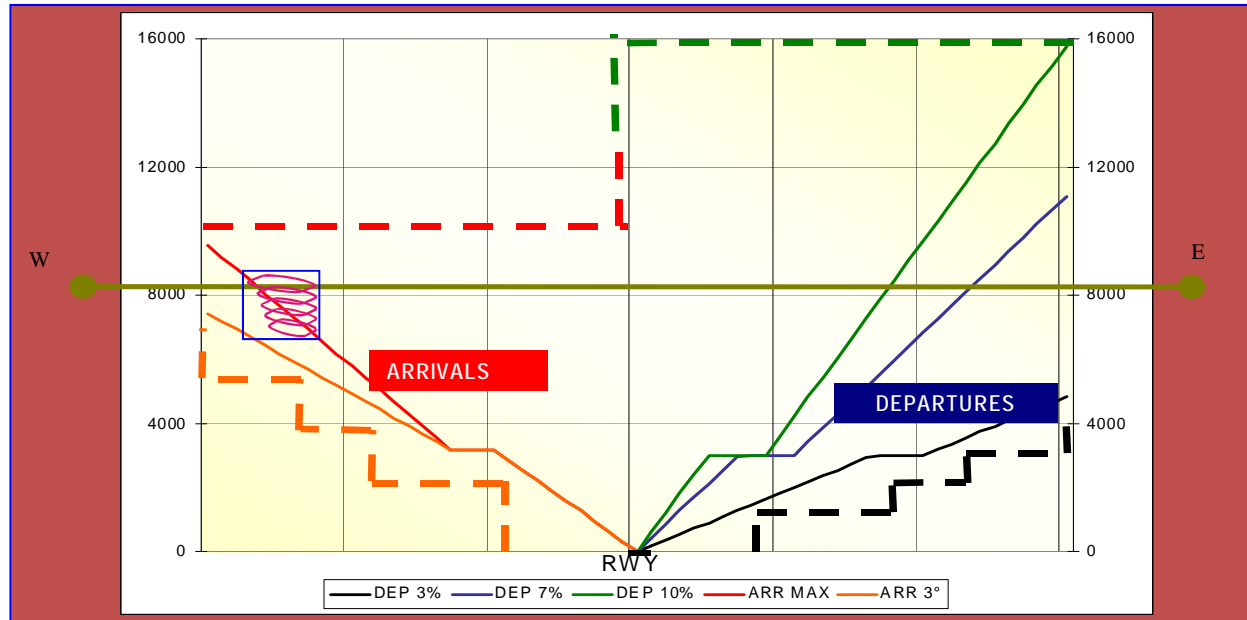
The above description is aimed at including TMA, CTA, CTR, ATZ airspace classification or any other nomenclature used to describe the airspace around an airport.



Competing Interests



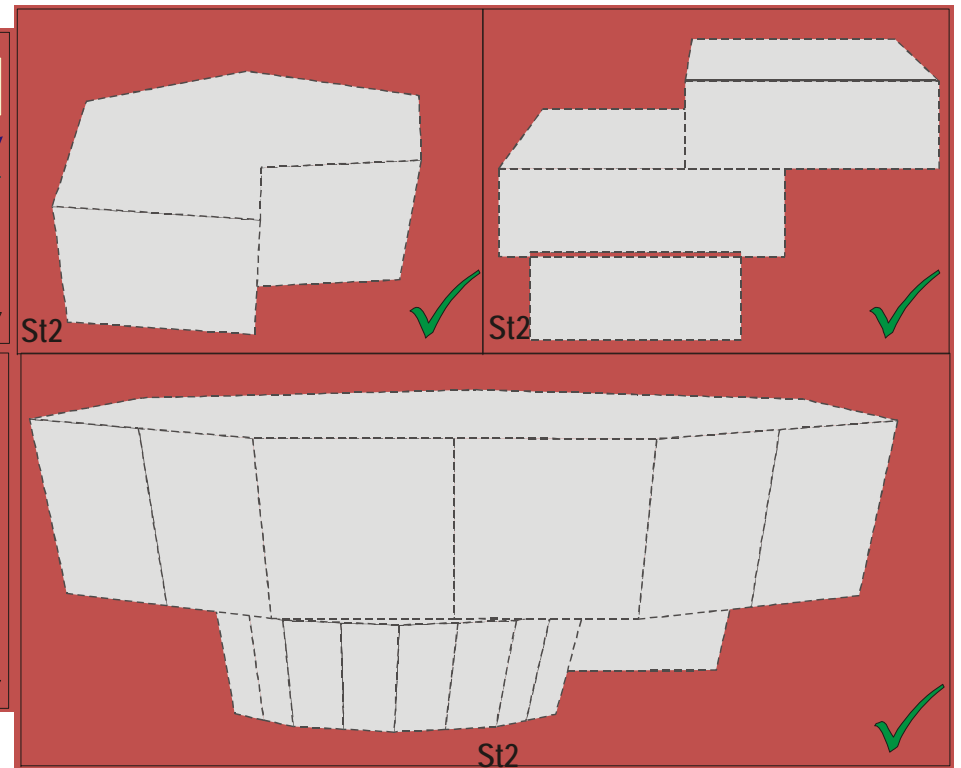
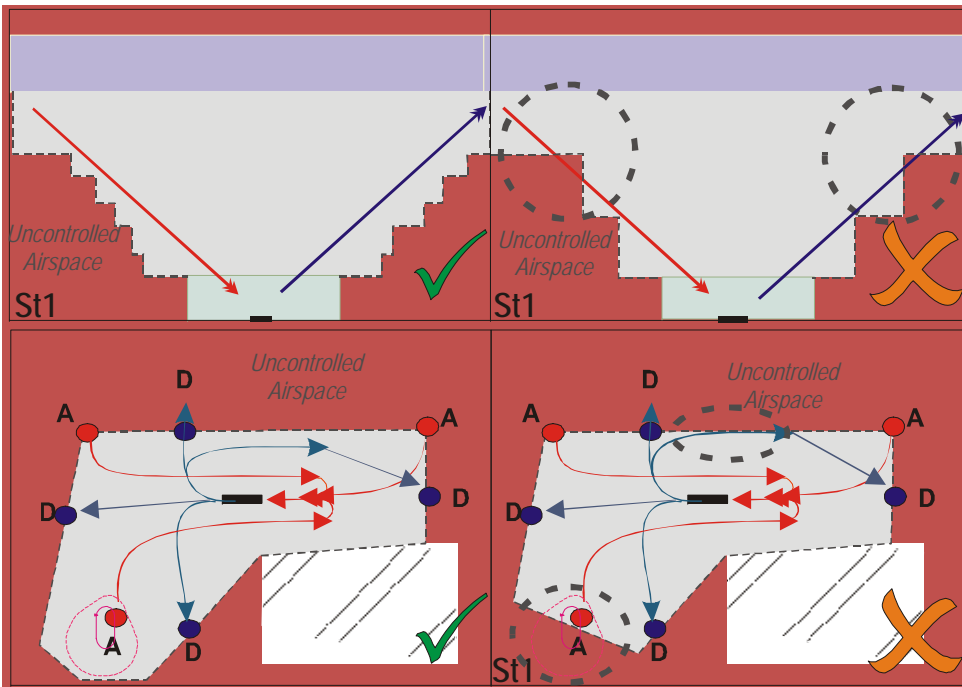
Airspace Volumes



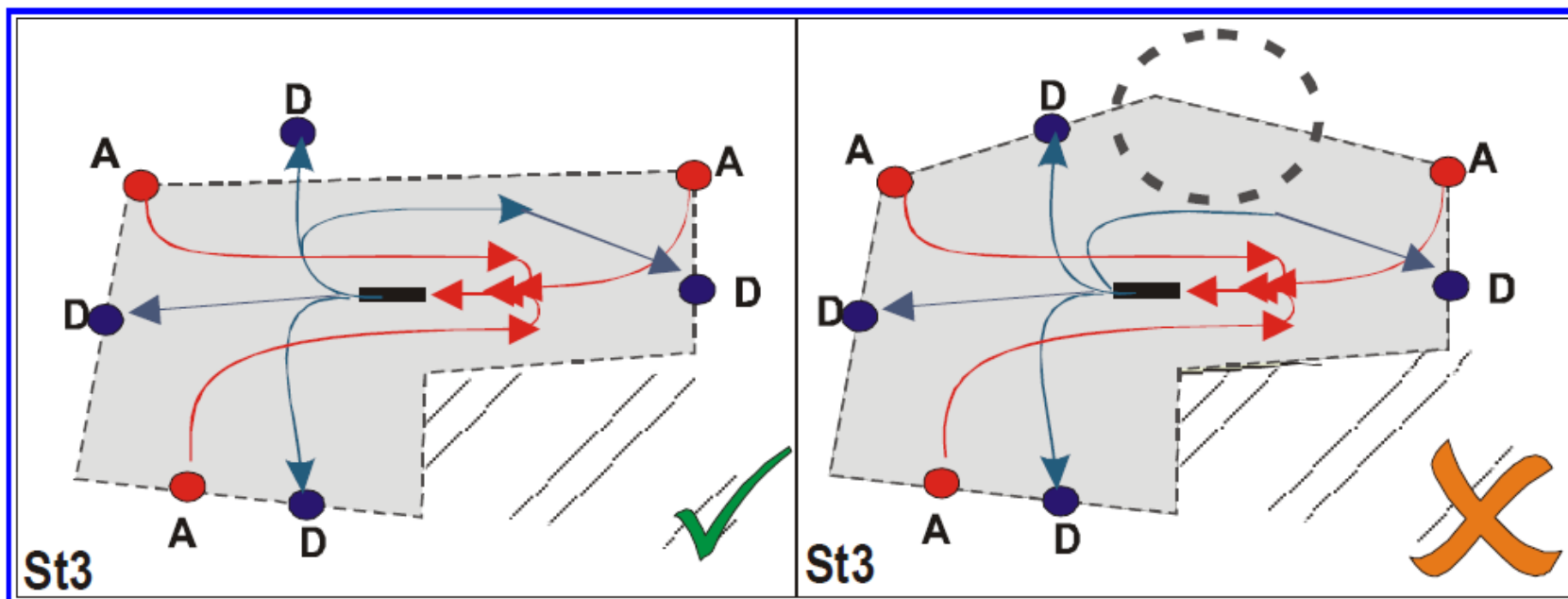
Airspace Volumes



Protect IFR Flight Paths

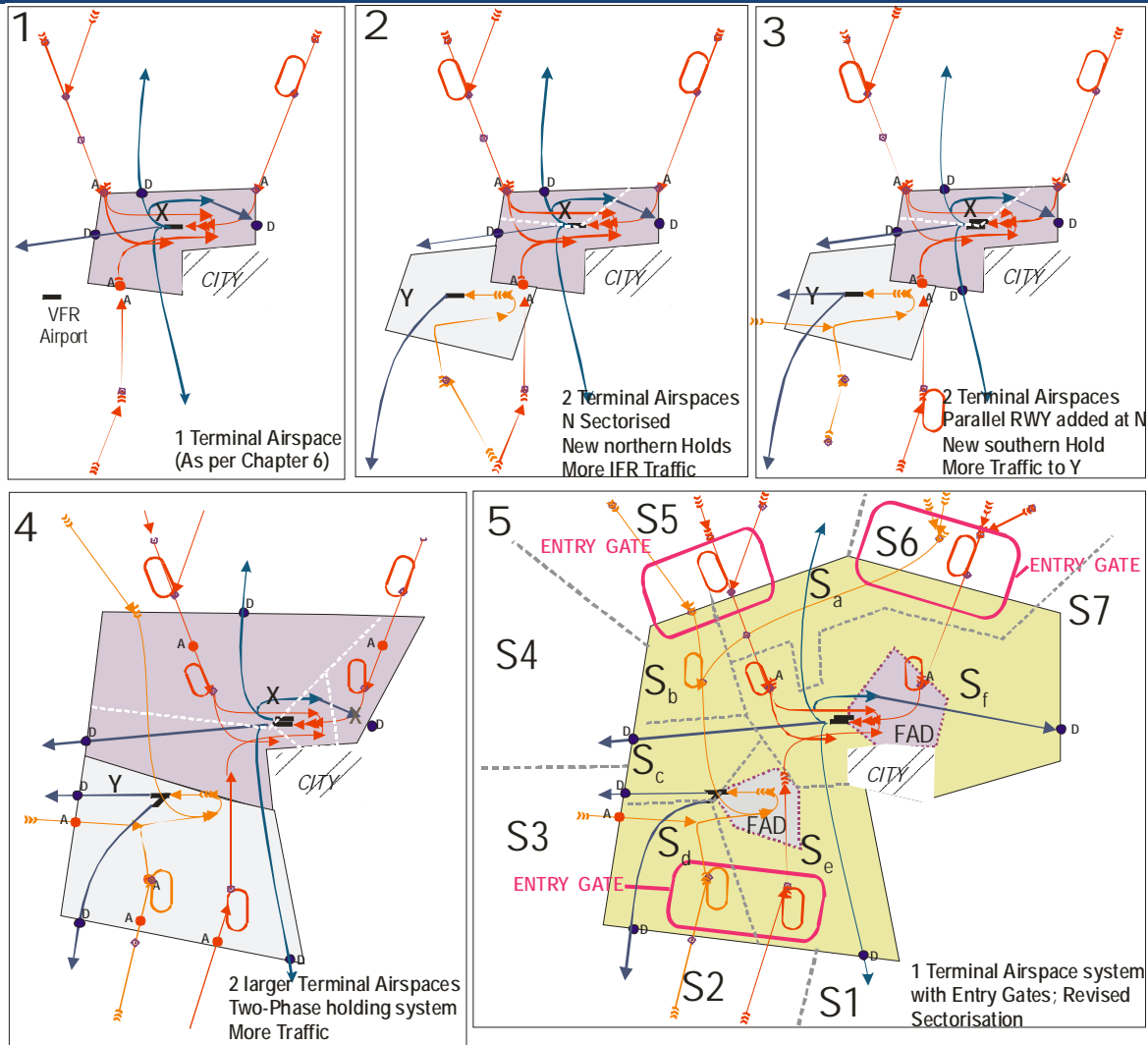


Airspace Volumes



Do not take more airspace than needed....

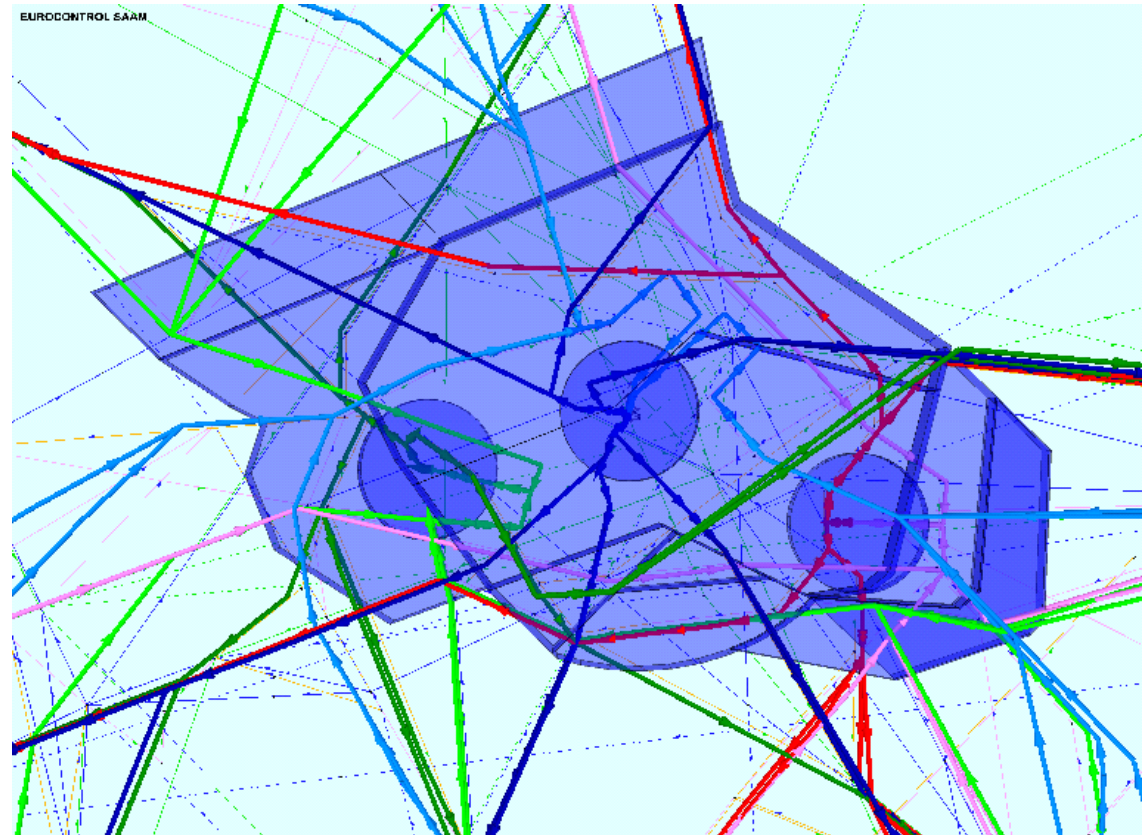
Terminal Airspace



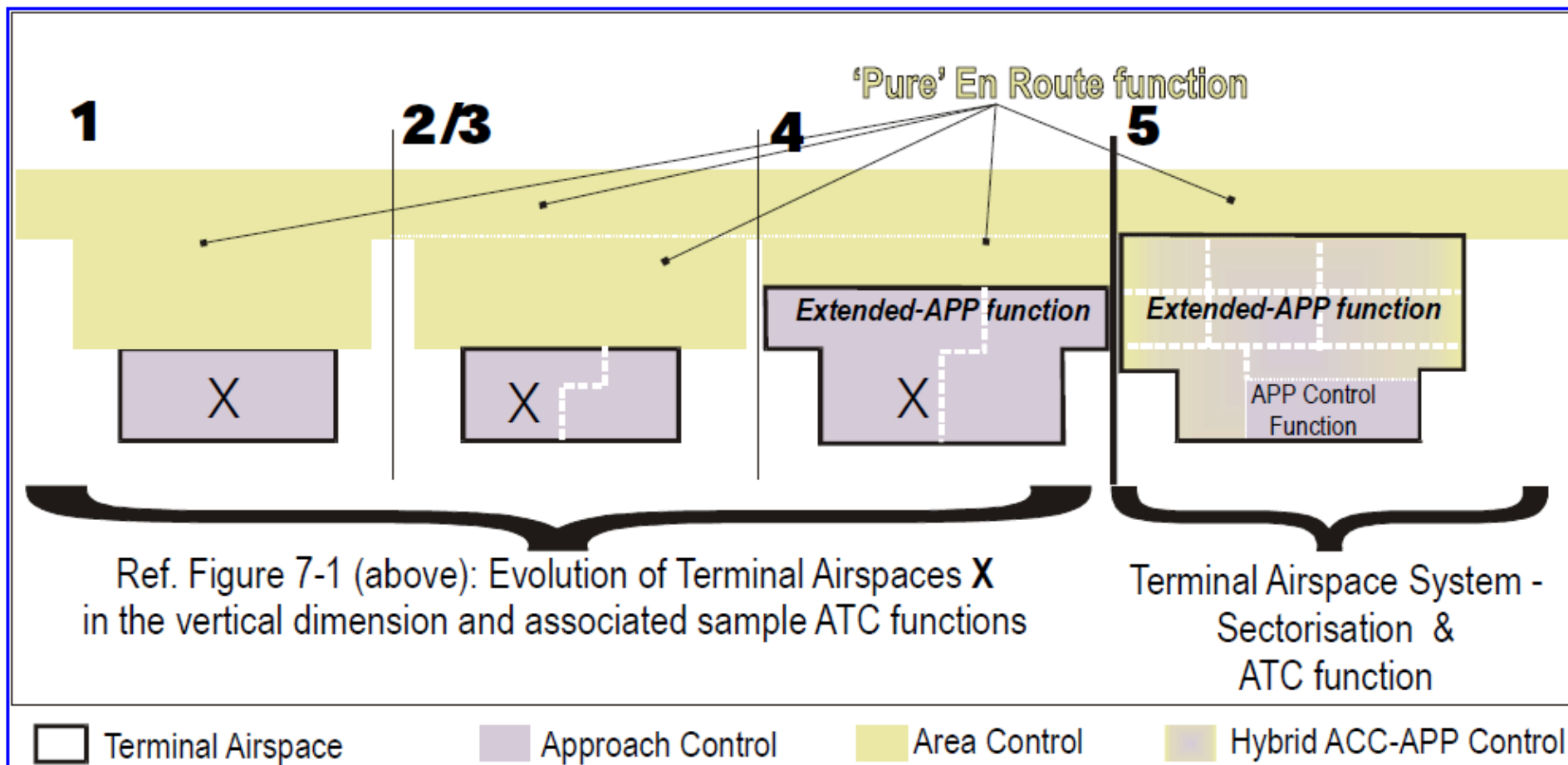
TMA



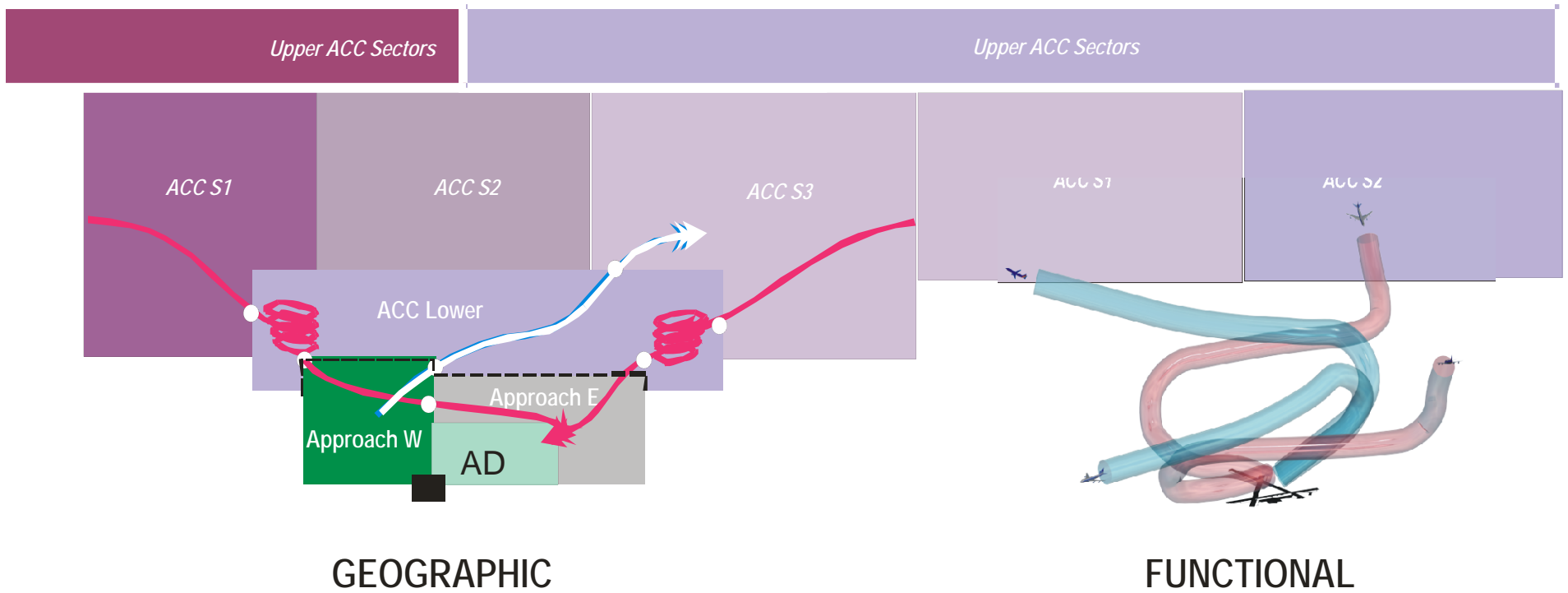
TMA – May combine two or more sector volume, aimed at improving the design and management of terminal routes and ATC sectorisation, servicing several airports in close proximity.



Evolution of functions



ATC Sectorisation



GEOGRAPHICAL SECTORISATION



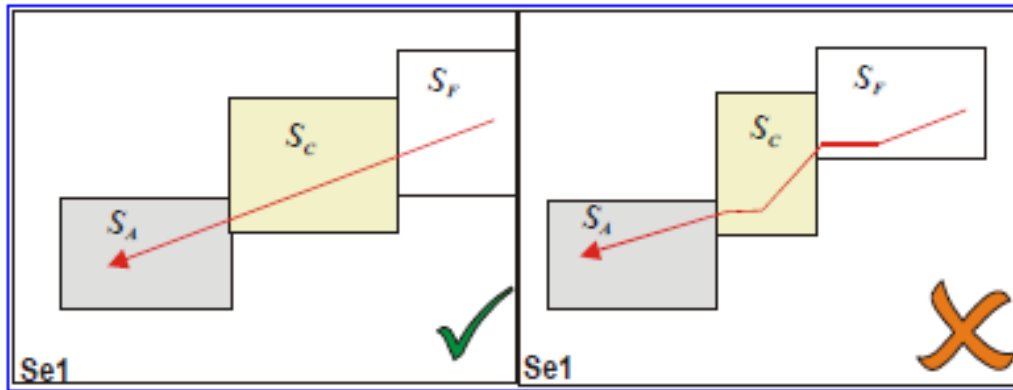
<u>Advantages</u>	<u>Disadvantages</u>
<ul style="list-style-type: none">→ Controller can fully exploit the space available in sector to manipulate best levels for inbounds/outbounds and expedite climb and descent without need for co-ordination.→ Easier to balance workload between sectors.→ Can be less demanding in terms of the Radar Display and ATC system→ Relatively easily to describe operational instructions for ATC areas of responsibility.	<ul style="list-style-type: none">→ Controller handles mixed traffic i.e. arrival, departure and transit traffic.→ In instances where the sector division runs along the runway centre-line, departing aircraft departing in different directions may be controlled by different controllers after take-off. (Effective mitigation can be provided by putting appropriate procedures in place).→ In cases where an aircraft is required to transit more than one geographic sector in the Terminal Airspace, this can add to complexity by requiring additional co-ordination.

FUNCTIONAL SECTORISATION



<u>Advantages</u>	<u>Disadvantages</u>
<ul style="list-style-type: none">→ Controller handles one traffic type i.e. either departures or arrivals because sector defined as a function of task.→ Usually, <i>all</i> Departing aircraft are on the same frequency after take-off.→ In some configurations, can prove more flexible to operate.	<ul style="list-style-type: none">→ Vertical/Lateral limits of sector can prove overly restrictive as one (vertical) band is unlikely to cater for all aircraft performance types.→ Difficult to balance workload between sectors especially where departure and arrival peaks do <i>not</i> coincide.→ Can be demanding in terms of the Radar Display and ATC System→ Operating instructions for ATC can be difficult to formulate with respect to areas of responsibility;

SECTORISATION



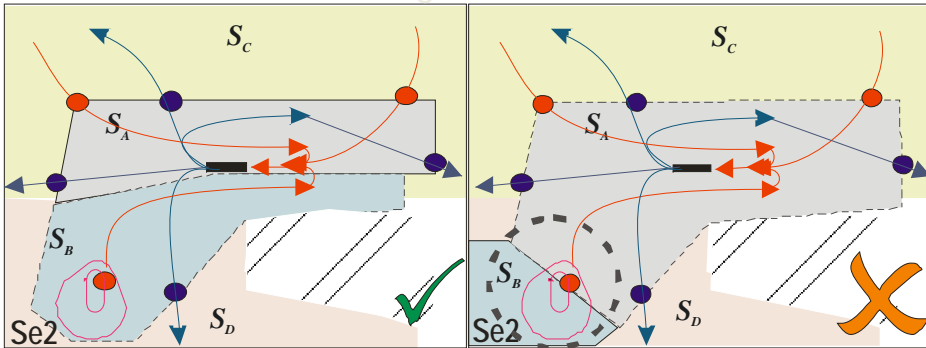
Avoid Sector designs that cause stepped climbs or descents

Sectorisation

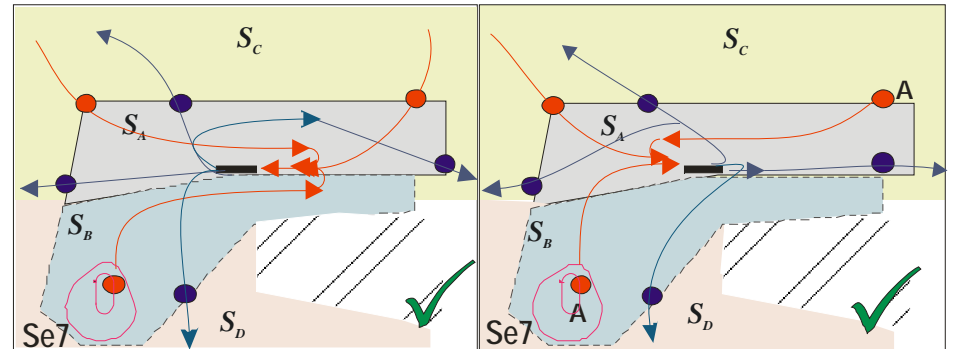
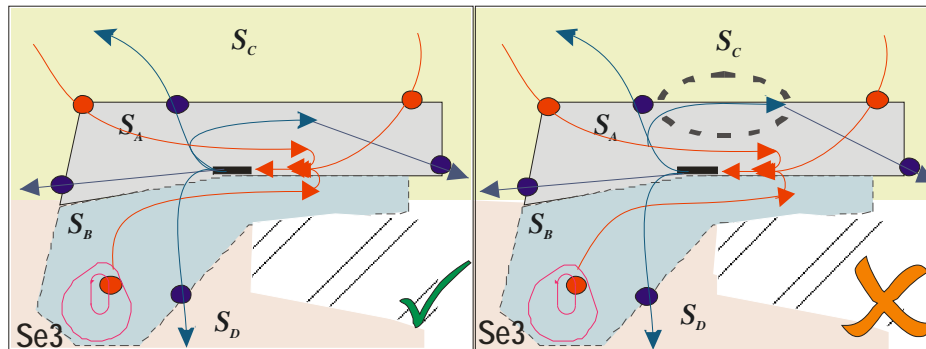
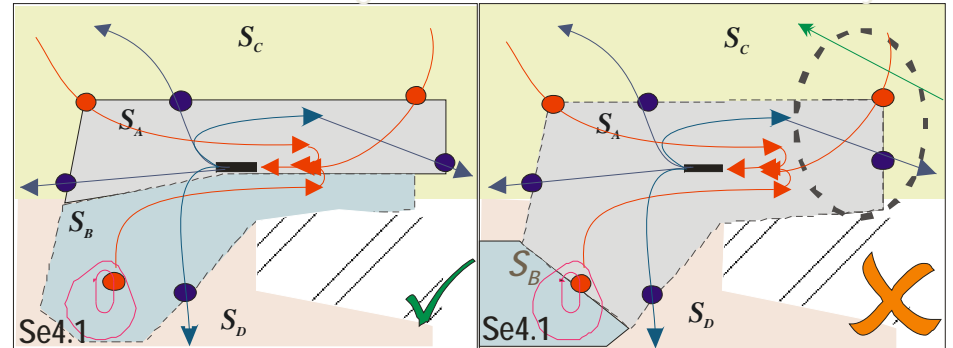


ATC Sectorisation

Maintain holding area in same sector



Avoid crossing too close to sector boundary



Sector boundaries should not coincide with route centre lines

Preferably, keep sectors the same when runway changes

Sectorisation



- SE4.2: THE VERTICAL LIMITS OF A GEOGRAPHICALLY DEFINED SECTOR NEED NOT BE UNIFORM I.E. FIXED AT ONE UPPER LEVEL OR ONE LOWER LEVEL, NOR NEED THESE VERTICAL LIMITS COINCIDE WITH THE VERTICAL LIMITS OF (HORIZONTALLY) ADJOINING SECTORS.

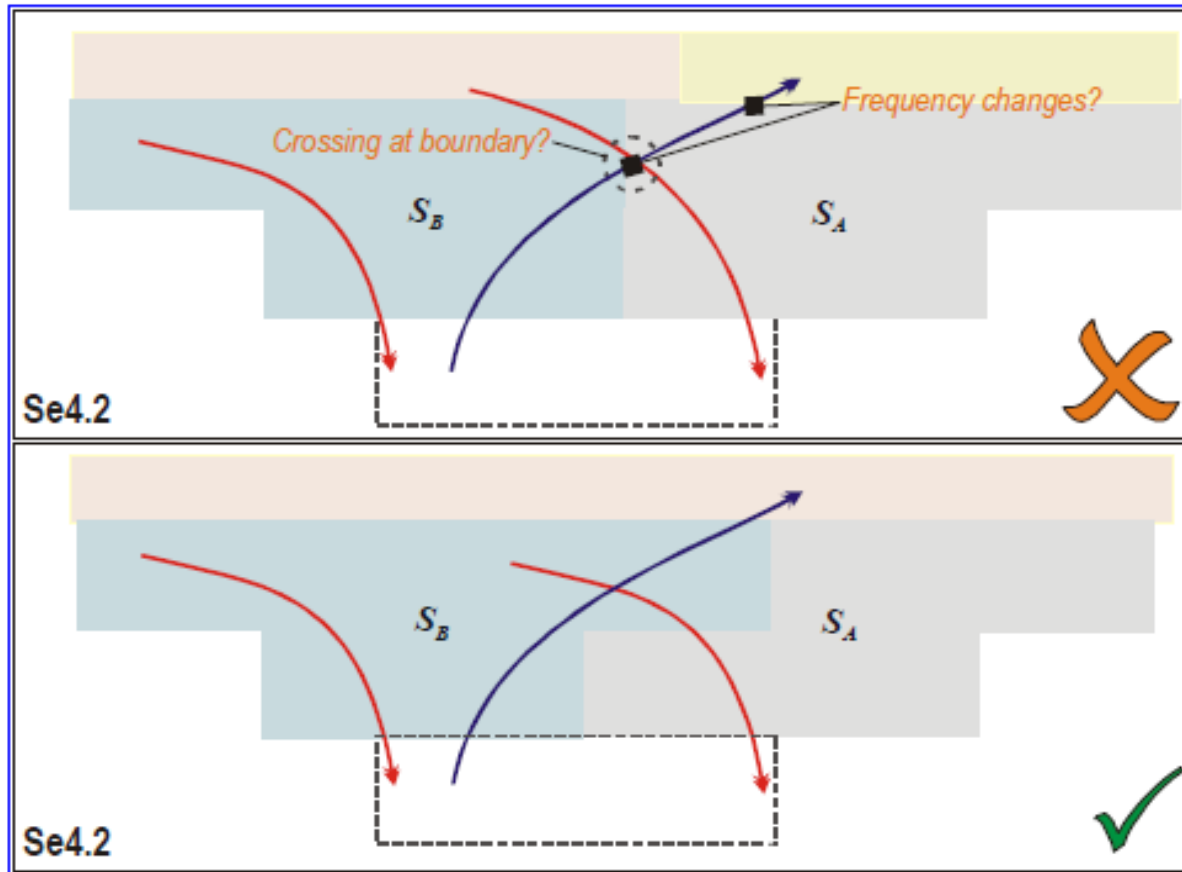


Figure 6- 15: Vertical Sector boundaries and crossing routes



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

South American
(SAM) Office
Lima

ICAO
Headquarters
Montreal

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) Office
Bangkok

Thank You