



**PBN**

# **AIRSPACE CONCEPT WORKSHOP**

## **Airspace Volumes & Sectorisation**



**Federal Aviation  
Administration**





# Overview

## OBJECTIVE

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





# Three GOLDEN RULES

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.

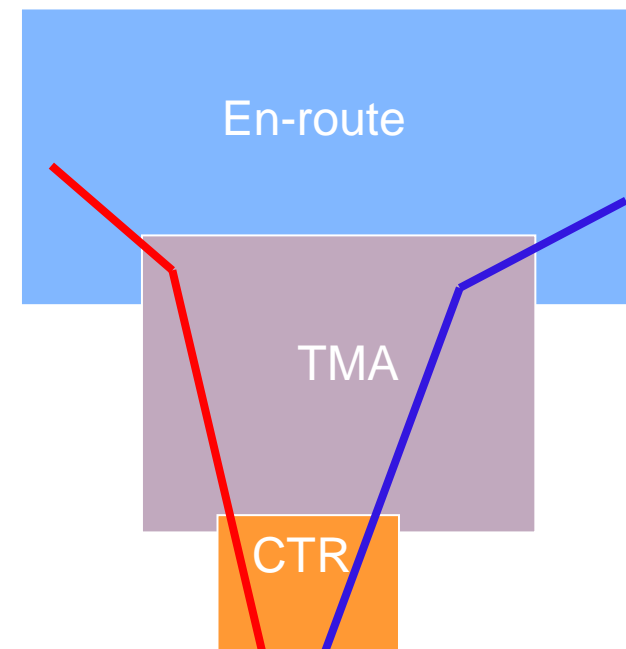


# TMA

## TMA

### Terminal control area

A control area normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes. [Doc. 4444]



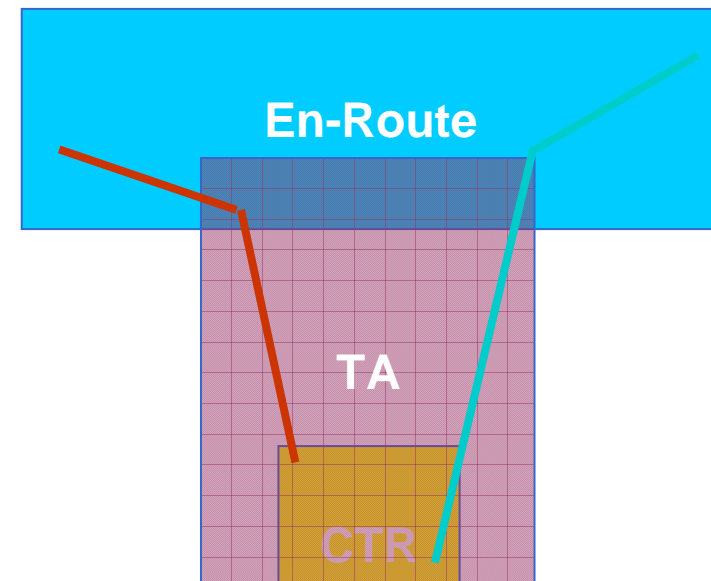


# Terminal Airspace

**Terminal Airspace (TA)** – is a generic term describing airspace which is part of the airspace continuum. Terminal airspace surrounds an airport, and it is an airspace within which air traffic services are provided. It encompasses all the various terminologies currently used throughout the ECAC region. Such airspace predominantly contains traffic operating along Terminal Routes or, to a lesser extent, ATS Routes of the ARN.

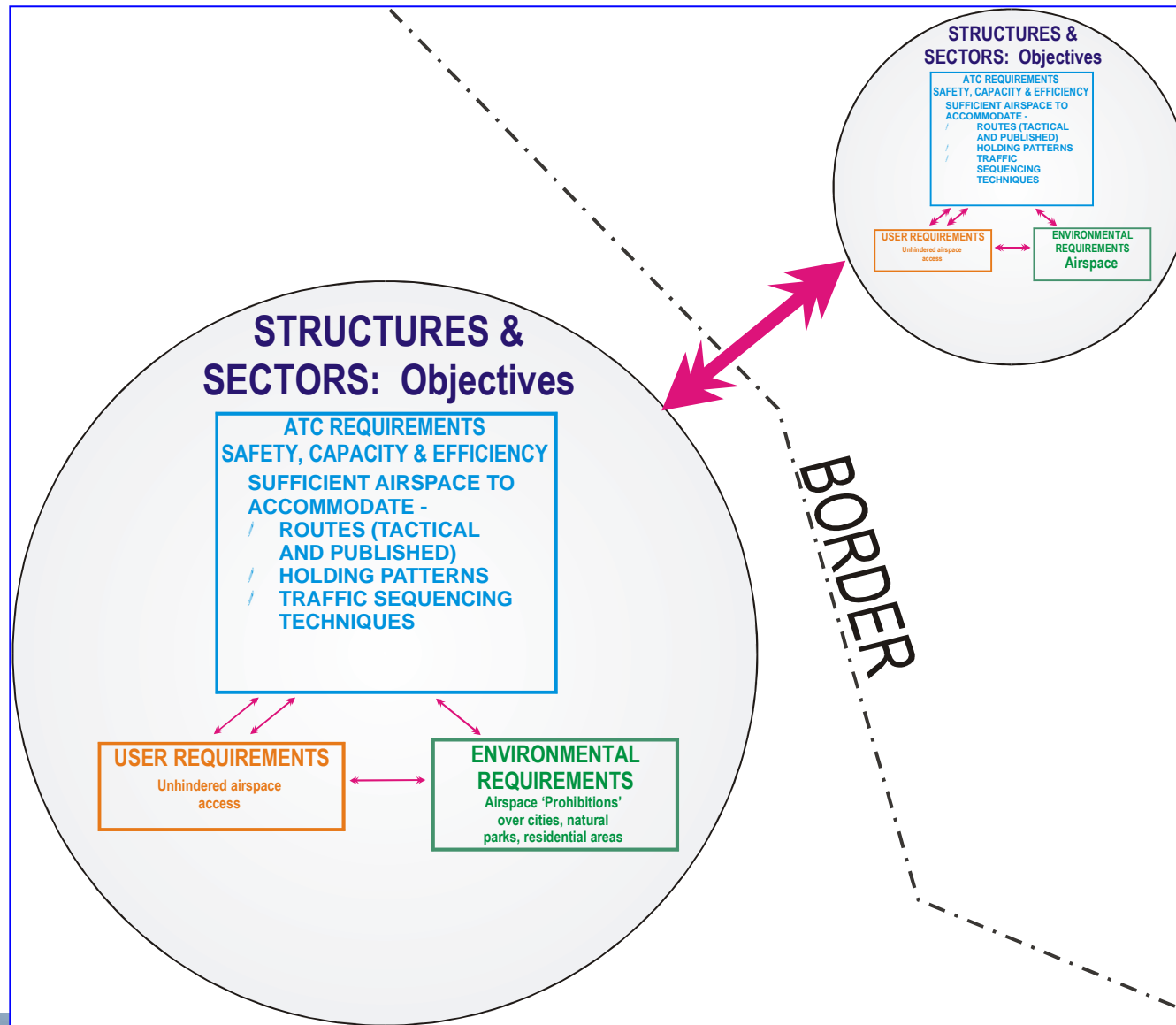
*[Explanatory note: The above description is aimed at including TMA, CTA, CTR, ATZ airspace classification or any other nomenclature used to describe the airspace around an airport].*

[The 2015 Airspace Concept & Strategy for the ECAC Area & Key Enablers]



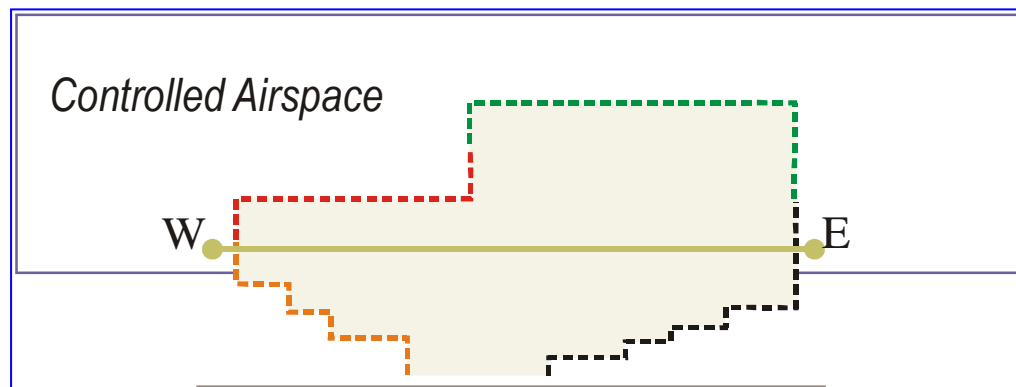
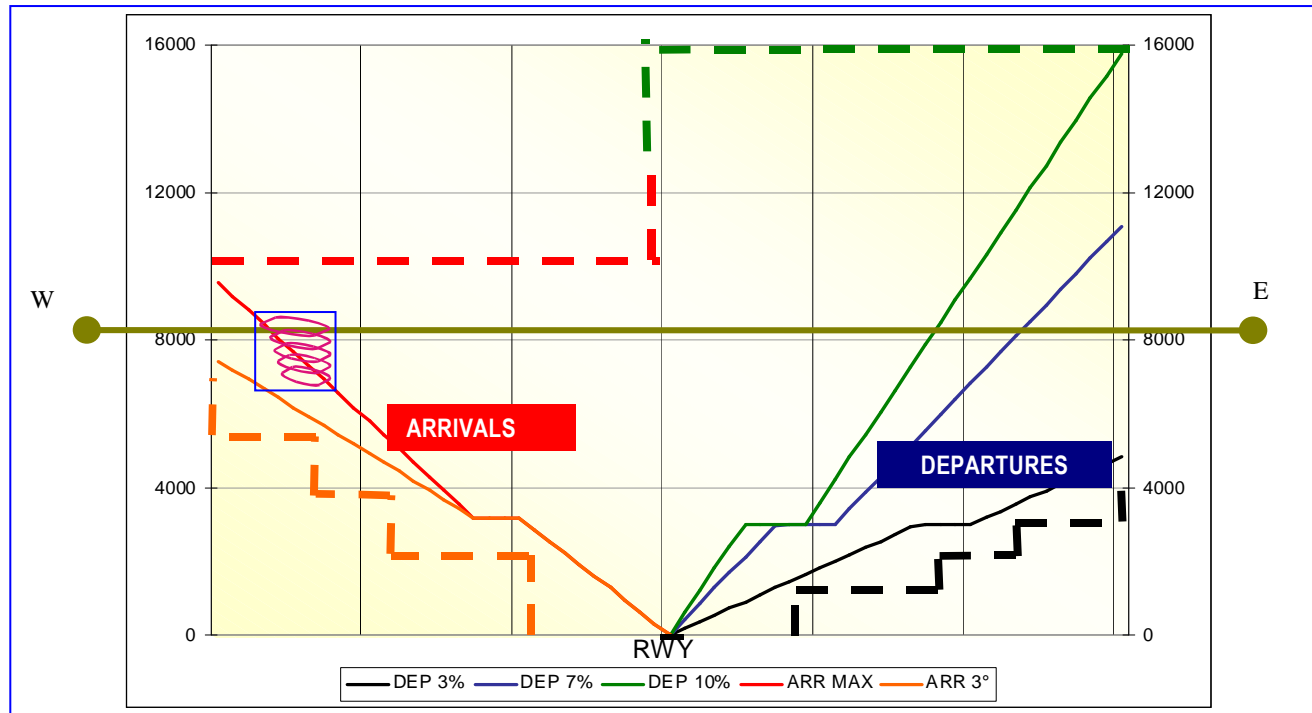


# Competing Interests

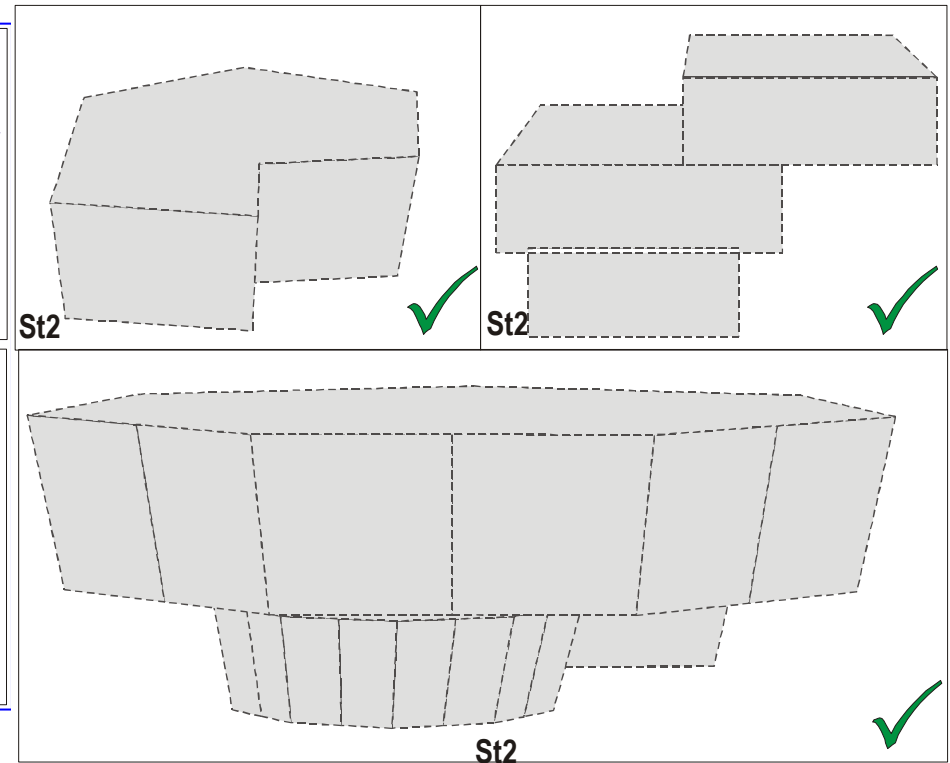
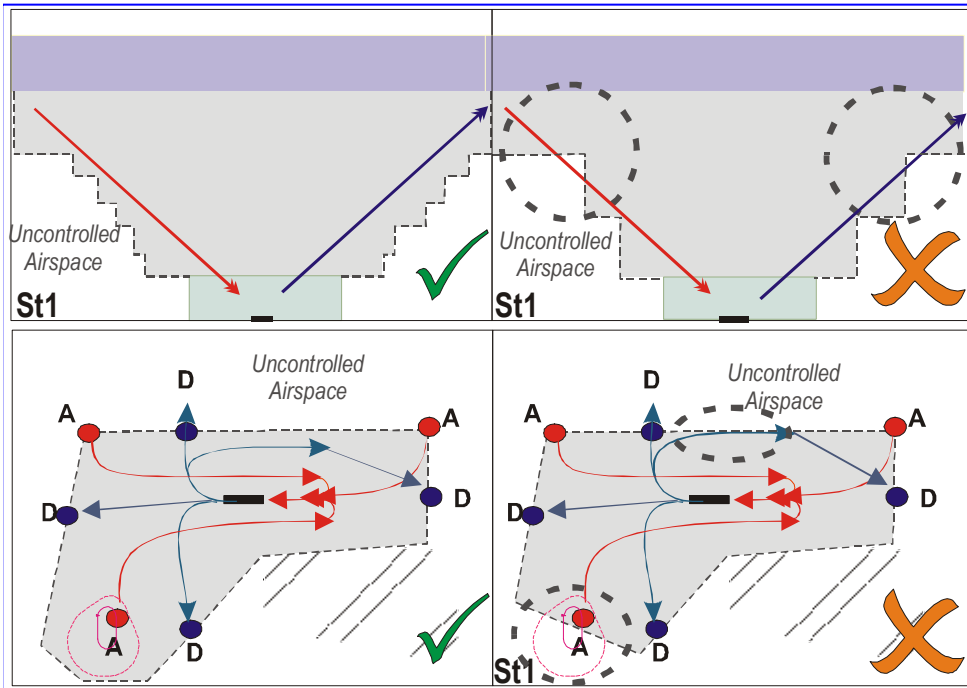




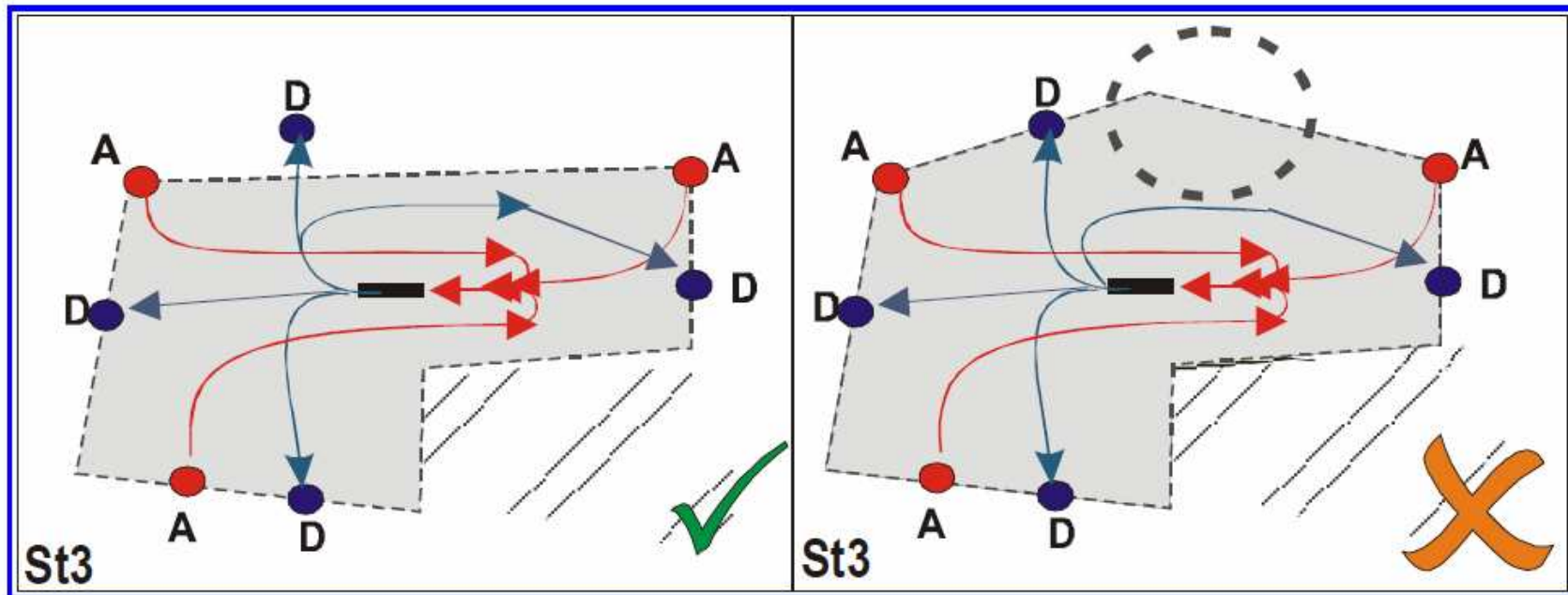
# Airspace Volumes



## Protect IFR Flight Paths



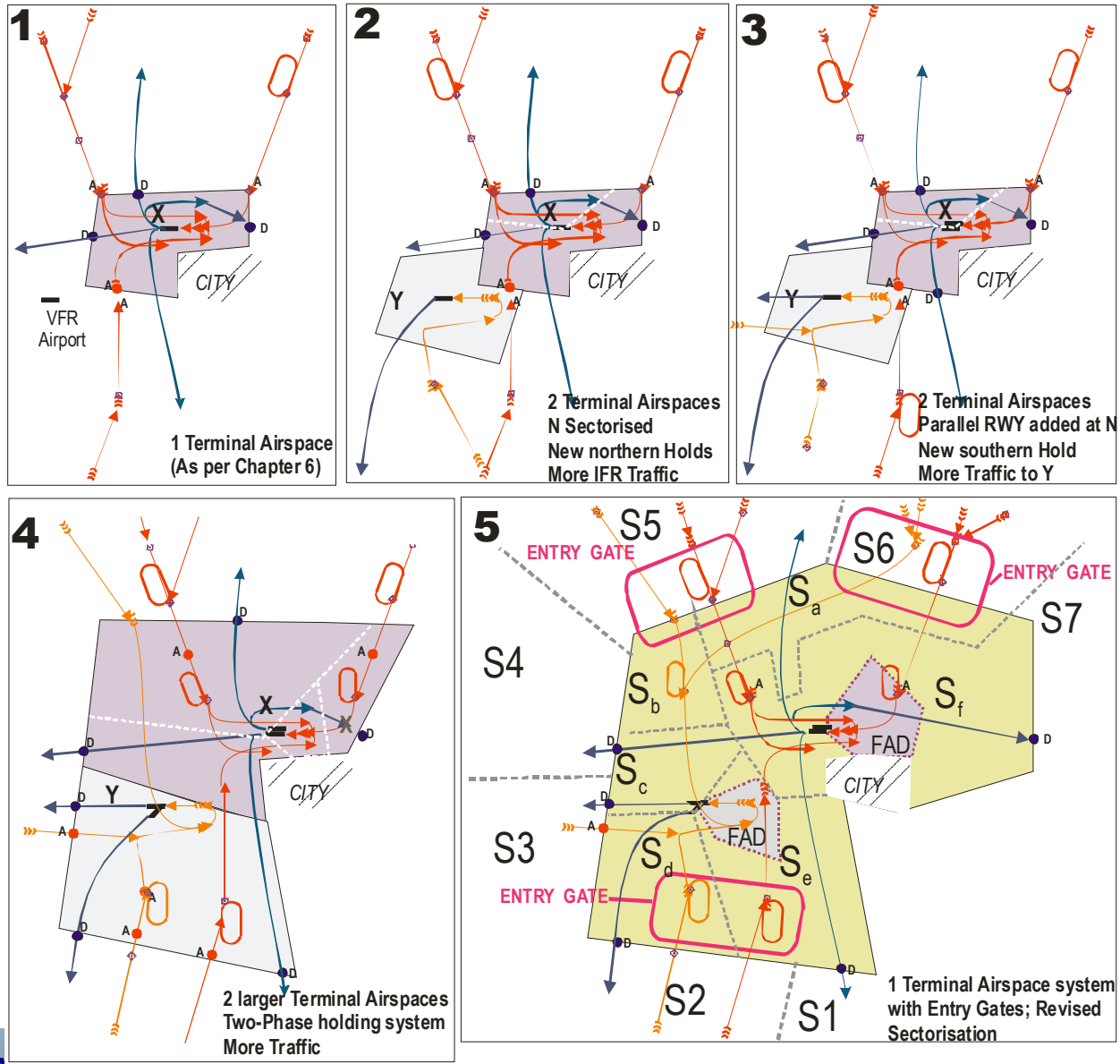
# Airspace Volumes



Do not take more airspace than needed....



# Terminal Airspace Systems

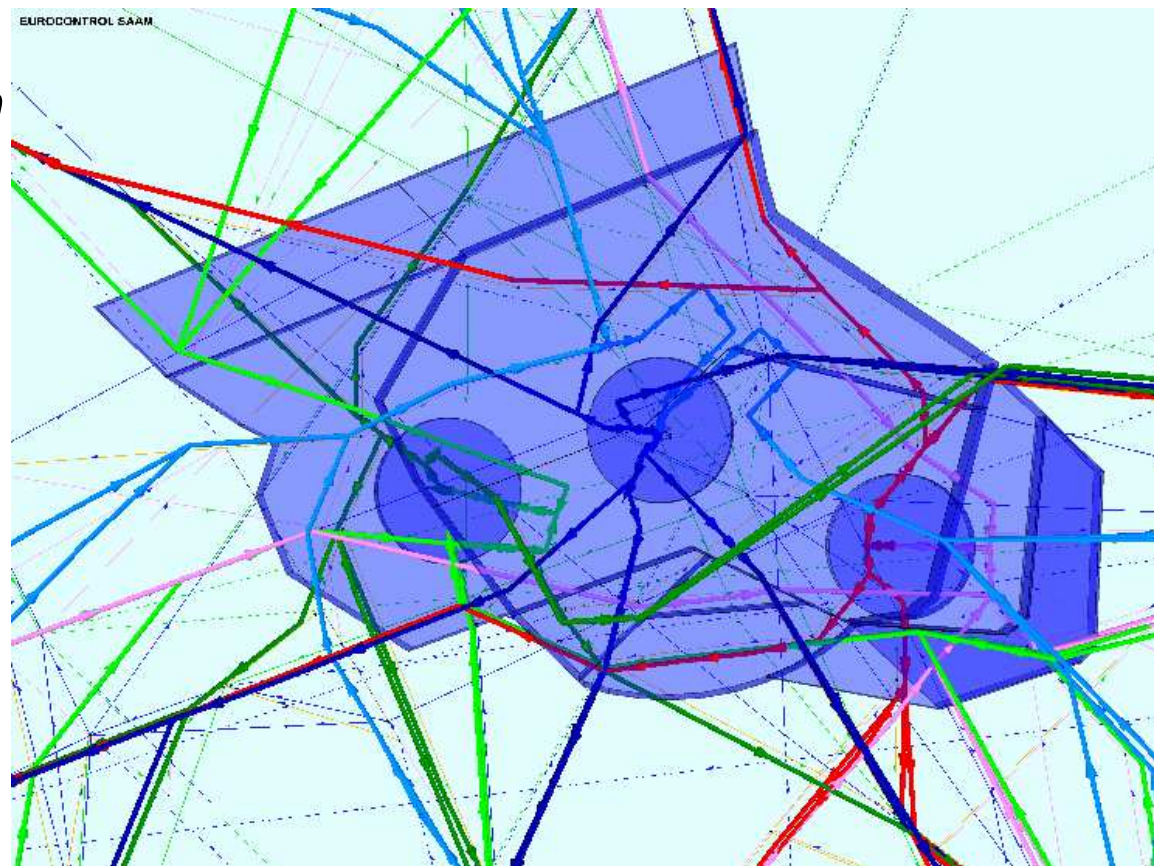




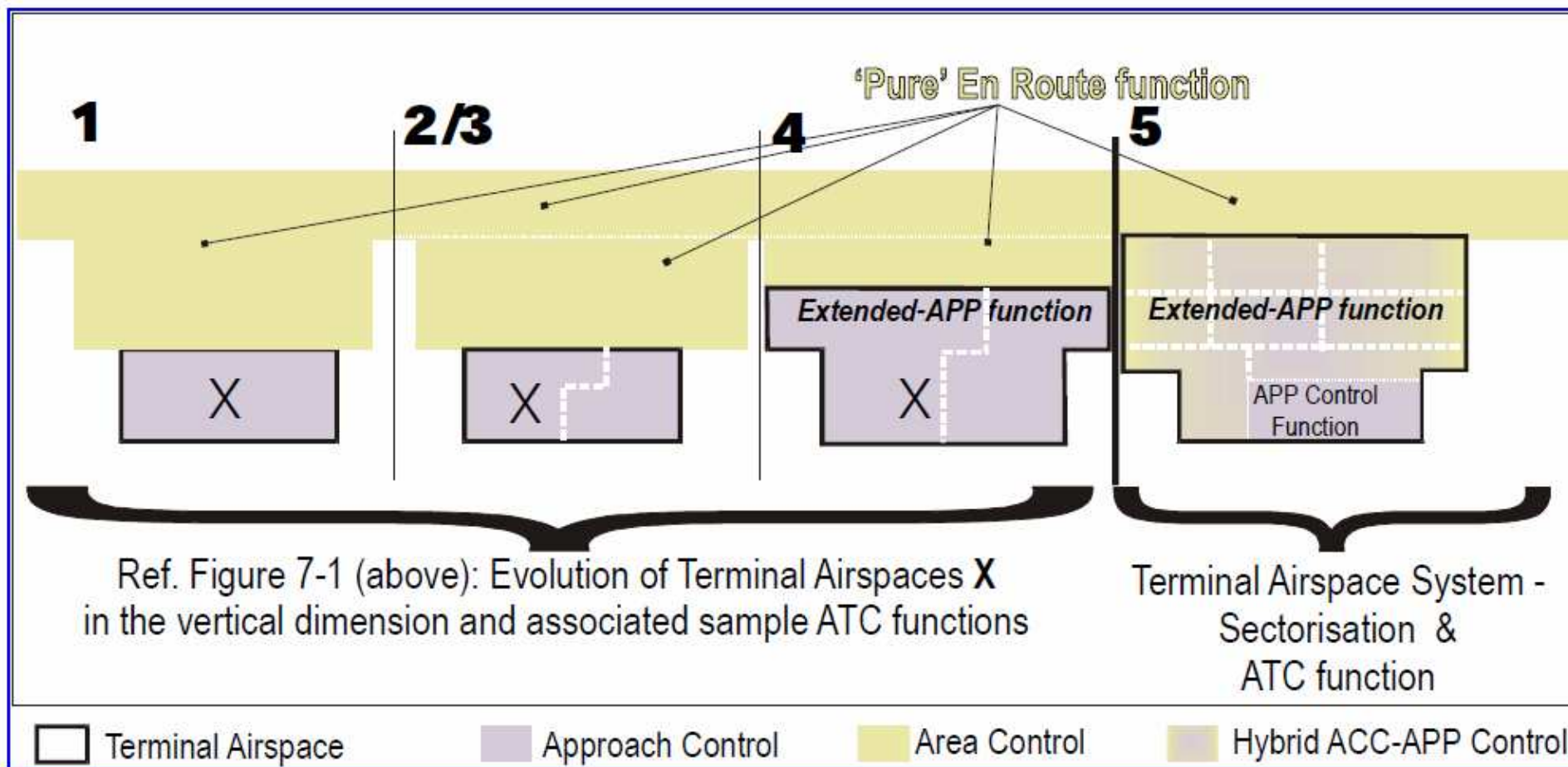
# Terminal Airspace System

**Terminal Airspace System (TAS)** – A system that combines two or more terminal airspace Volumes, aimed at improving the design and management of terminal routes and ATC sectorisation, servicing several airports in close proximity.

[The 2015 Airspace Concept & Strategy for the ECAC Area & Key Enablers]



# Evolution of functions





# SECTORISATION

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→ Functional

→ Geographical



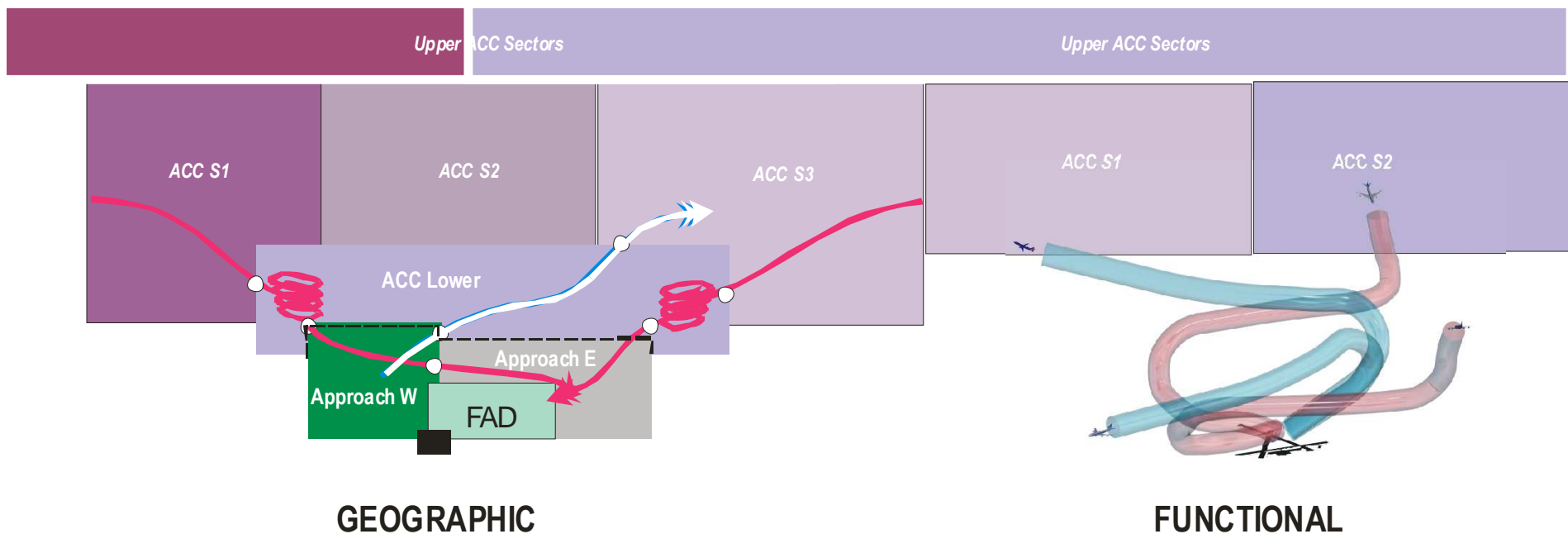
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# ATC Sectorisation





# GEOGRAPHICAL

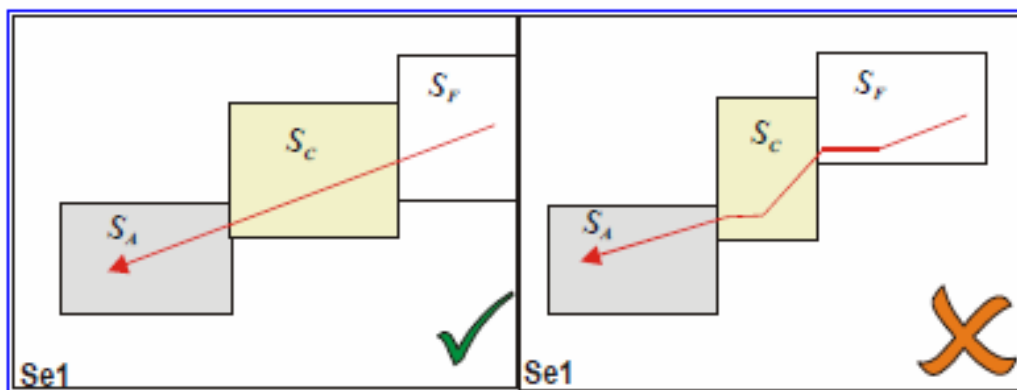
<u>Advantages</u>	<u>Disadvantages</u>
<ul style="list-style-type: none"><li>→ Controller can fully exploit the space available in sector to manipulate best levels for inbounds/outbounds and expedite climb and descent without need for co-ordination.</li><li>→ Easier to balance workload between sectors.</li><li>→ Can be less demanding in terms of the Radar Display and ATC system</li><li>→ Relatively easily to describe operational instructions for ATC areas of responsibility.</li></ul>	<ul style="list-style-type: none"><li>→ Controller handles mixed traffic i.e. arrival, departure and transit traffic.</li><li>→ 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).</li><li>→ 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.</li></ul>



# FUNCTIONAL

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

# SECTORISATION

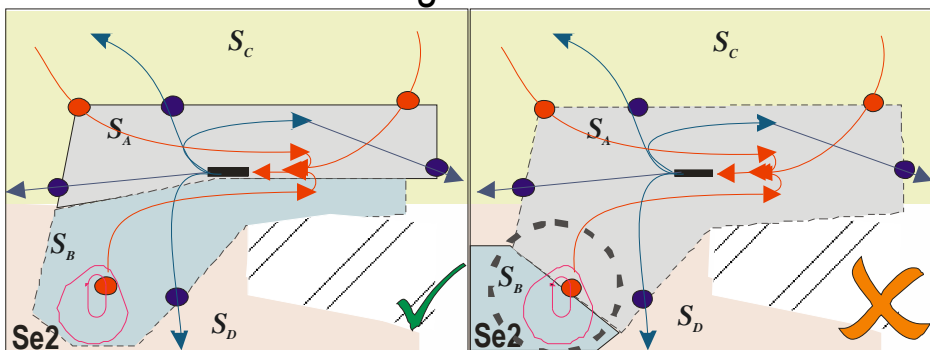


Avoid Sector designs that cause stepped climbs or descents

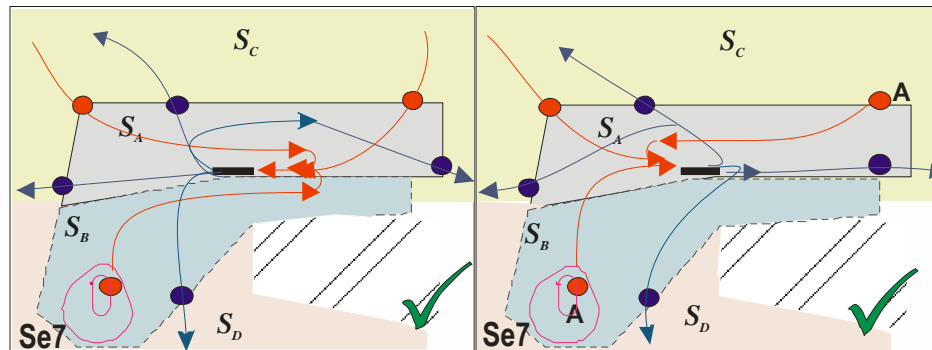
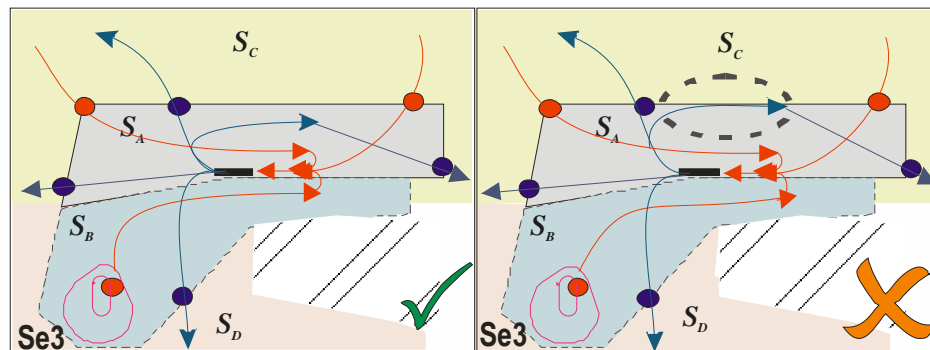
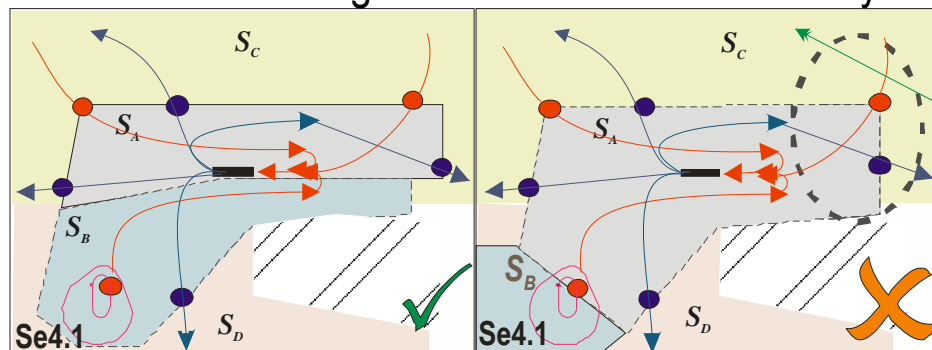
# Sectorisation

## 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



- **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.

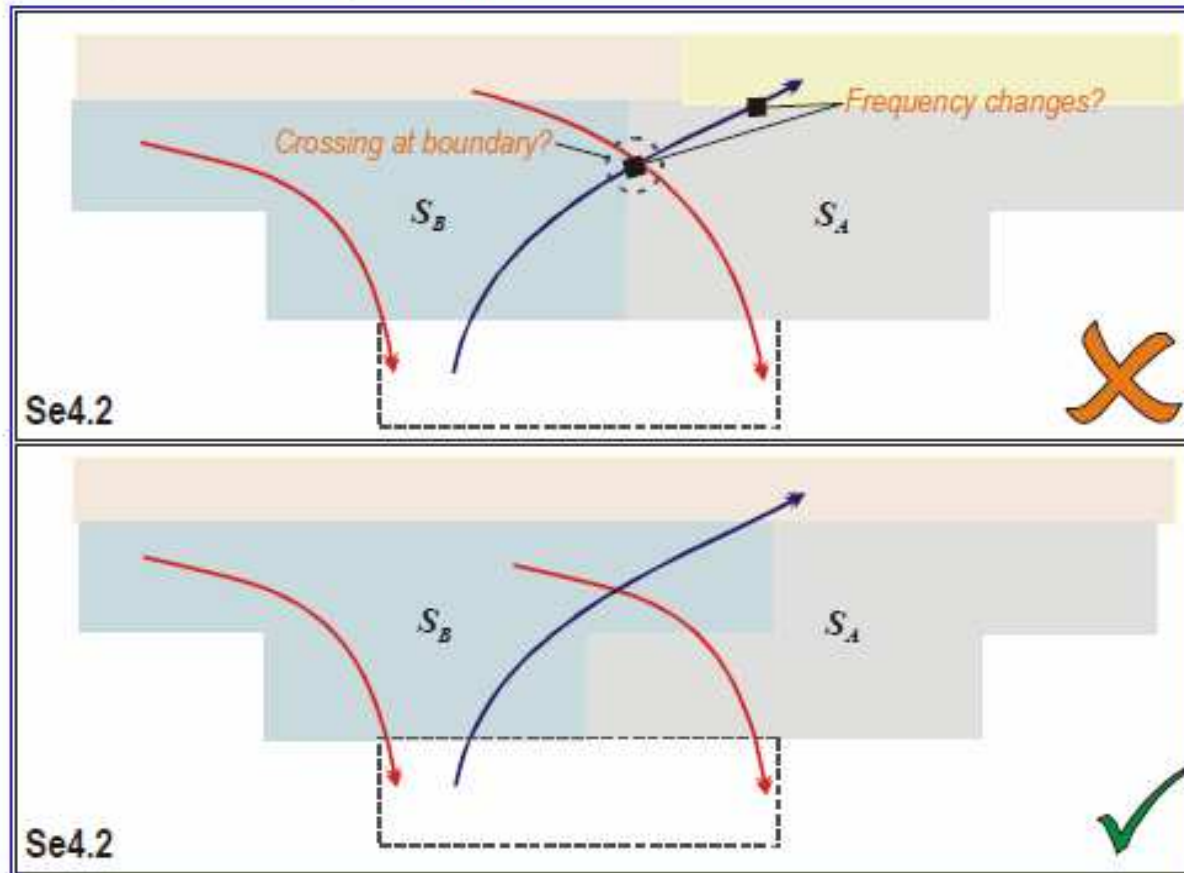
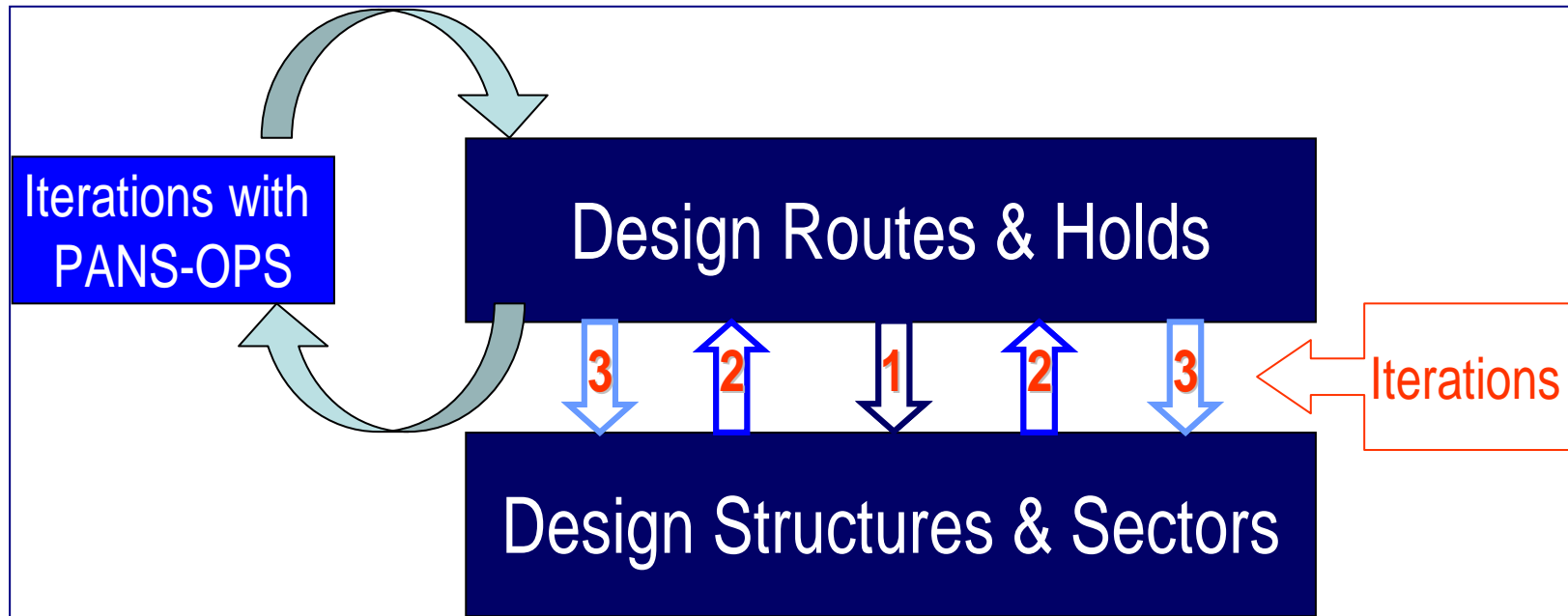


Figure 6- 15: Vertical Sector boundaries and crossing routes



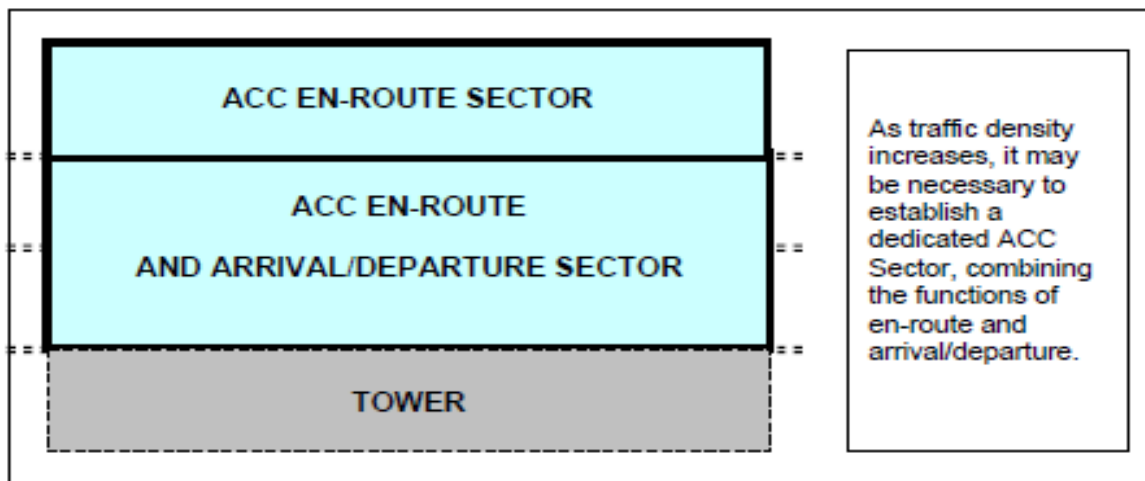
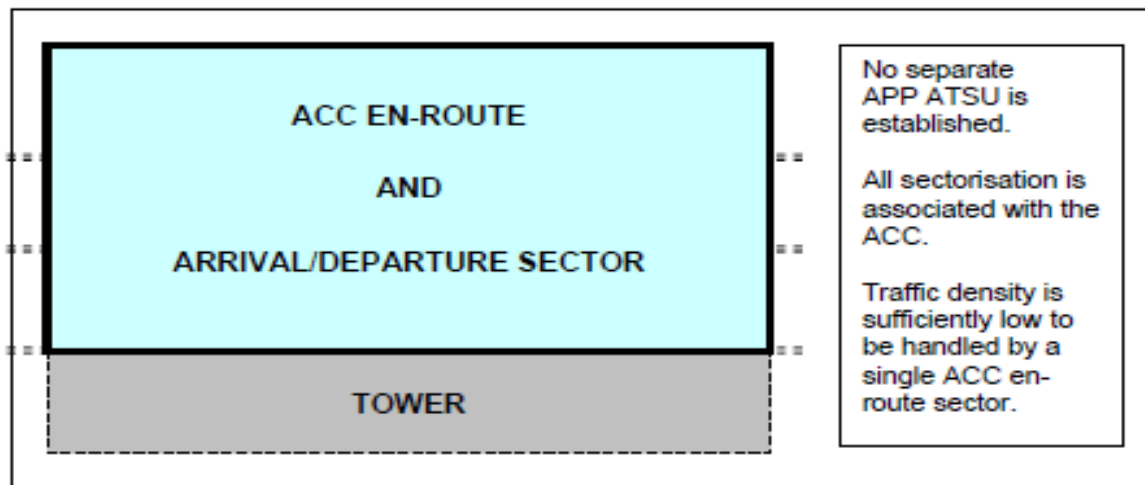


# ITERATIONS



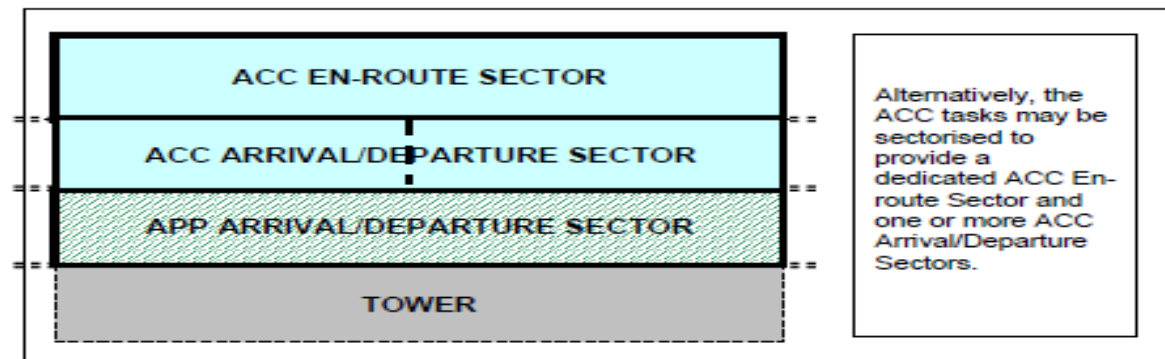
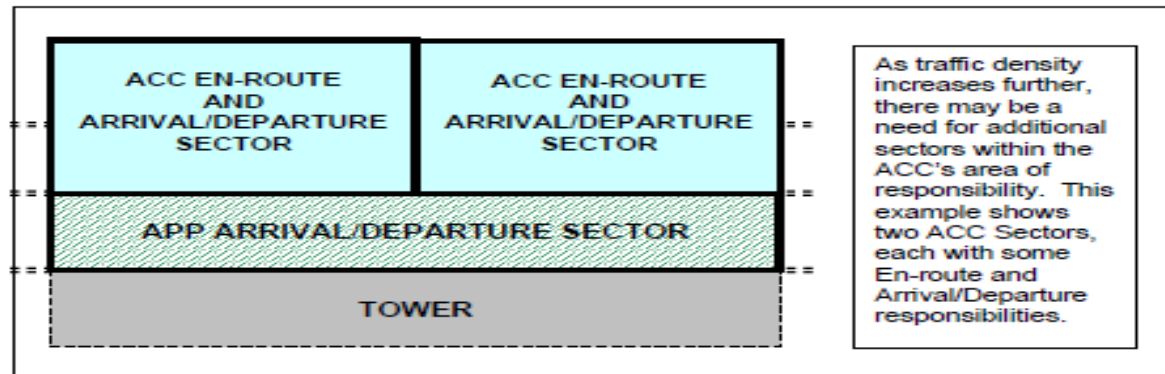
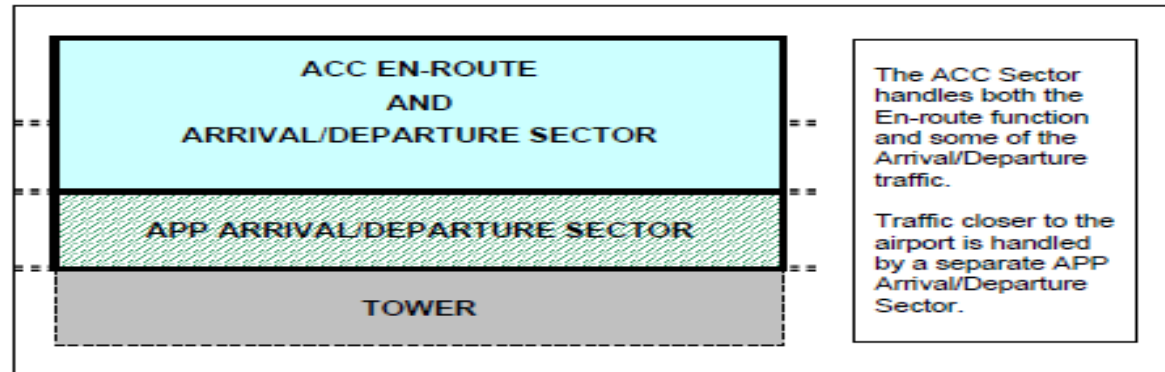


# DESIGN OPTIONS (1)



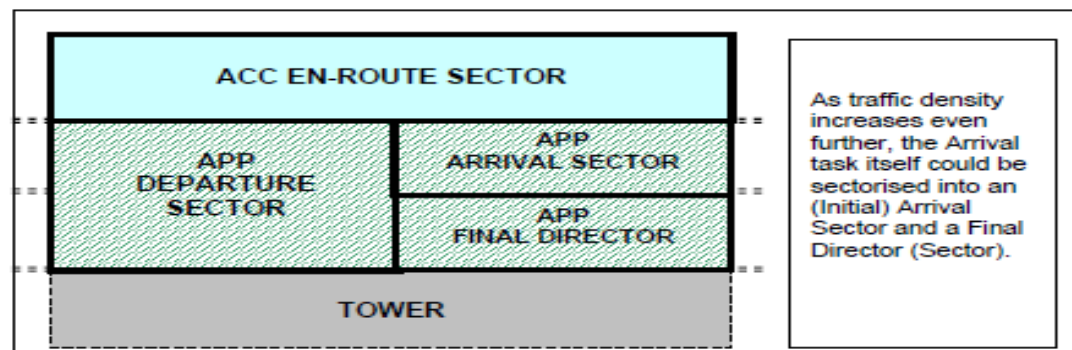
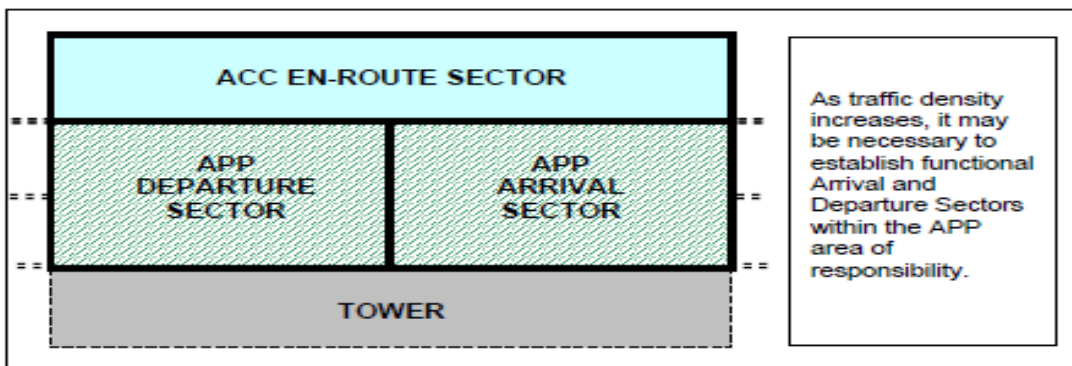
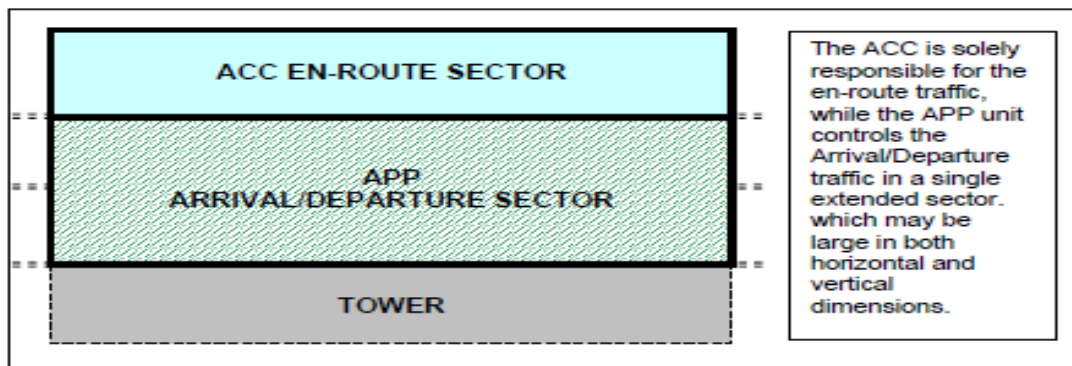


# DESIGN OPTIONS (2)



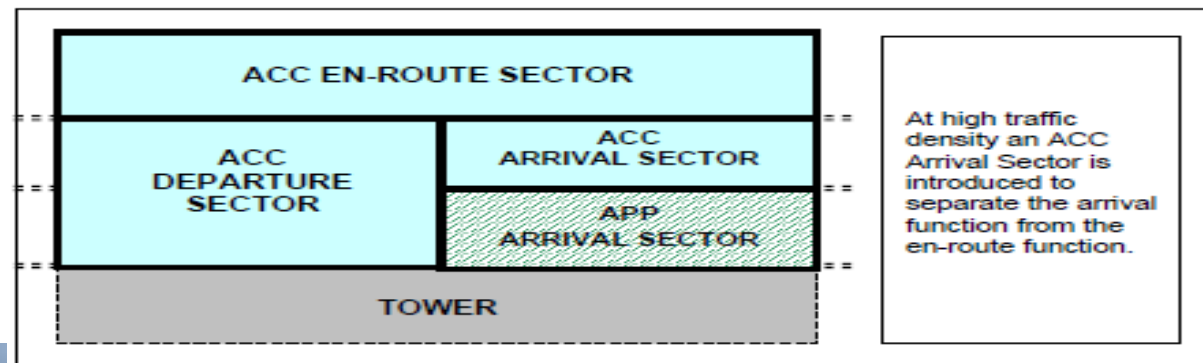
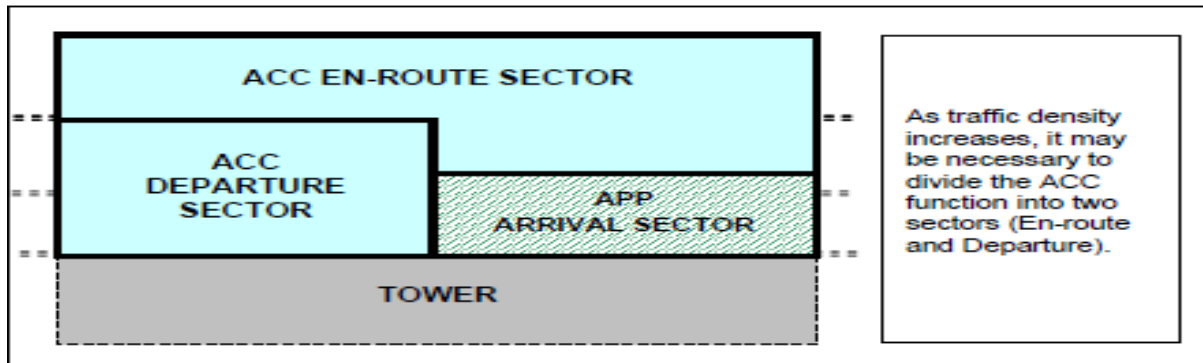
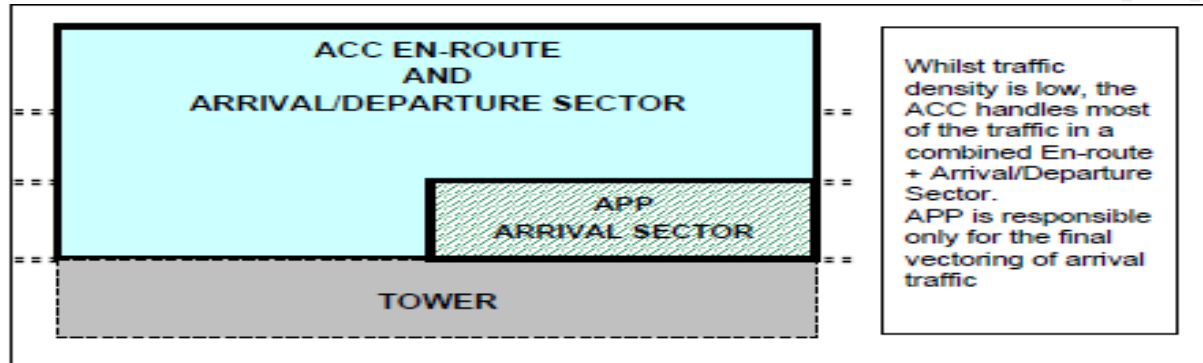


# DESIGN OPTIONS (3)



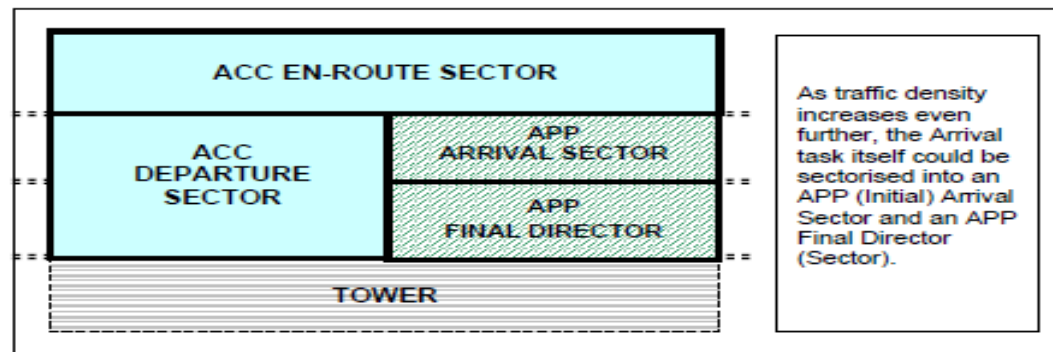
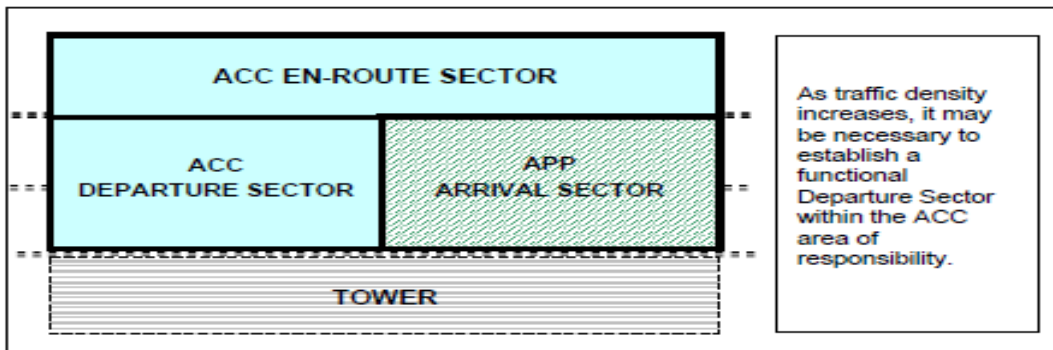
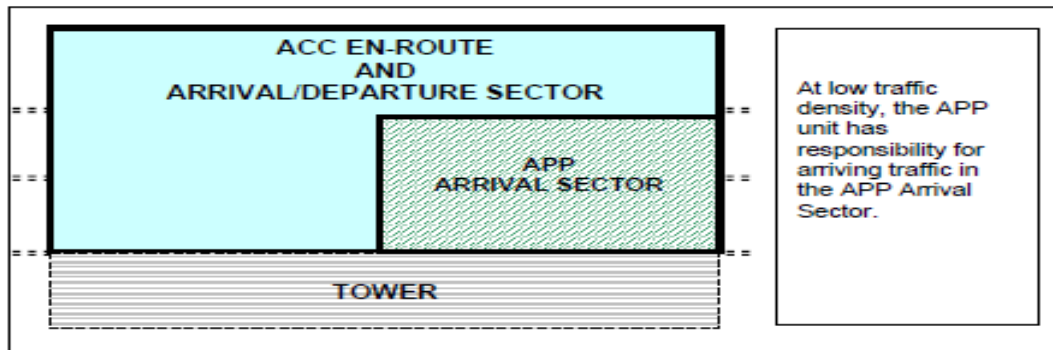


# DESIGN OPTIONS (4)





# DESIGN OPTIONS (5)





# Sample Checklist: Structures and Sectors

Checklist STRUCTURES AND SECTORS (ref. Part C, Ch.6)	
<b>1. Terminal Airspace Structures (ref. Part C 6.4.2)</b>	
	<ul style="list-style-type: none"> <li>• Are all terminal routes, holding patterns and their associated protected airspace contained within controlled airspace?</li> <li>• Does the upper limit of the terminal airspace coincide with the lower limit of the superimposed controlled airspace in order to continuous protection of IFR flight paths?</li> <li>• Is the terminal airspace compatible with the routes and holds that are to be contained within it?</li> <li>• Are both vertical and lateral dimensions of the terminal airspace structure compatible with aircraft flight profiles?</li> <li>• Have obstacle clearances been taken into account while determining if both vertical and lateral dimensions of the terminal airspace structure compatible with aircraft flight profiles?</li> <li>• Is the lateral airspace designated to the terminal airspace restricted to the airspace necessary to contain terminal routes (in order not to constrain the operation of non-participating flights)?</li> <li>• Is the lower limit of the airspace designated to the terminal airspace restricted to the necessary airspace to contain terminal routes (in order not to constrain the operation of non-participating flights)?</li> <li>• Is the possibility investigated to fuse adjacent terminal airspaces into one terminal block so as to reduce the operational complexity?</li> <li>• Is flexible use of airspace implemented or envisaged in the design (activation and de-activation of parts of the TMA subject to real-time operational requirements of different airspace users)?</li> <li>• Are buffers incorporated or envisaged in the design with respect to airspace reservations outside the terminal airspace in order to ensure that ATIS can provide an adequate margin of safety?</li> </ul>
<b>2. Sectors (ref. Part C 6.4.3)</b>	
	<ul style="list-style-type: none"> <li>• Are the lateral and vertical dimensions of sectors designed as such that stepped level clearances, especially over short distances are avoided to the extent possible?</li> <li>• Are the protected airspaces surrounding holding patterns included in single geographically defined sectors?</li> <li>• Is the design of each sector done in accordance with the design of adjacent, subjacent and superimposed sectors?</li> <li>• Does the design of sectors meet the rationale that crossing points of terminal and/or other routes should not be placed too close to a boundary of a geographically defined sector as so to allow the receiving controller sufficient anticipation time to resolve conflicts?</li> <li>• Is the fact considered that 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?</li> <li>• Are buffers incorporated or envisaged in the design with respect to airspace reservations outside the terminal airspace in order to ensure that ATIS can provide an adequate margin of safety?</li> <li>• Are all potential sector combinations taken into account when determining the sector configuration?</li> <li>• Are the geographically defined pre-defined sequencing sectors designed to encompass the main arrival flows designed with a view to merging arrival traffic progressively as they approach the terminal area?</li> <li>• Is it operationally required that the upper limit of a sector coincides with the lower limit of</li> </ul>



# THANK YOU

