



INTERNATIONAL CIVIL AVIATION ORGANIZATION

A United Nations Specialized Agency

PBN Airspace Design Workshop

Airspace Volumes and Sectorisation

**Asia and Pacific Regional Sub-Office
Beijing, China**

APAC RSO BEIJING

Objective



- ❖ **This module provides an understanding of airspace volumes and sectorisation in support of Air Traffic Management**

Airspace Sectorisation



- **Airspace and sector design is used to balance workload**
- **Airspace is delineated to define responsibility**
- **Airspace volumes are used to exclude/contain operations (military, prohibited, national borders, etc.)**
- **Airspace volumes may also be defined due to equipment limitations**

Three GOLDEN RULES

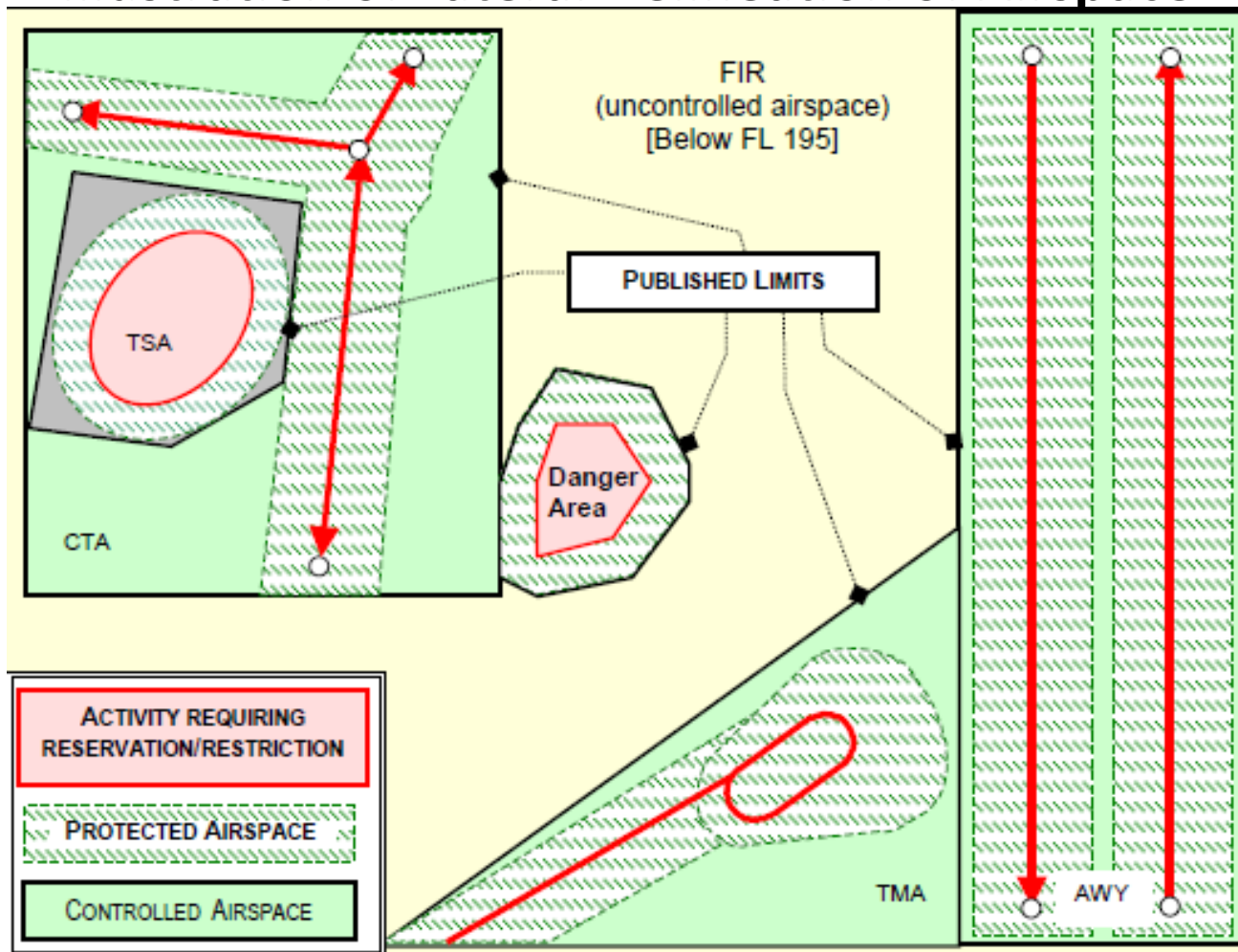


- ❖ **Airspace Volumes protect IFR Flight paths**
- **Design volumes **AFTER** the routes have been designed**
- **Do not design routes to fit into pre-existing airspace volumes**
- **Only delineate as much airspace volume as needed**

Good Design Practice - Sectorisation



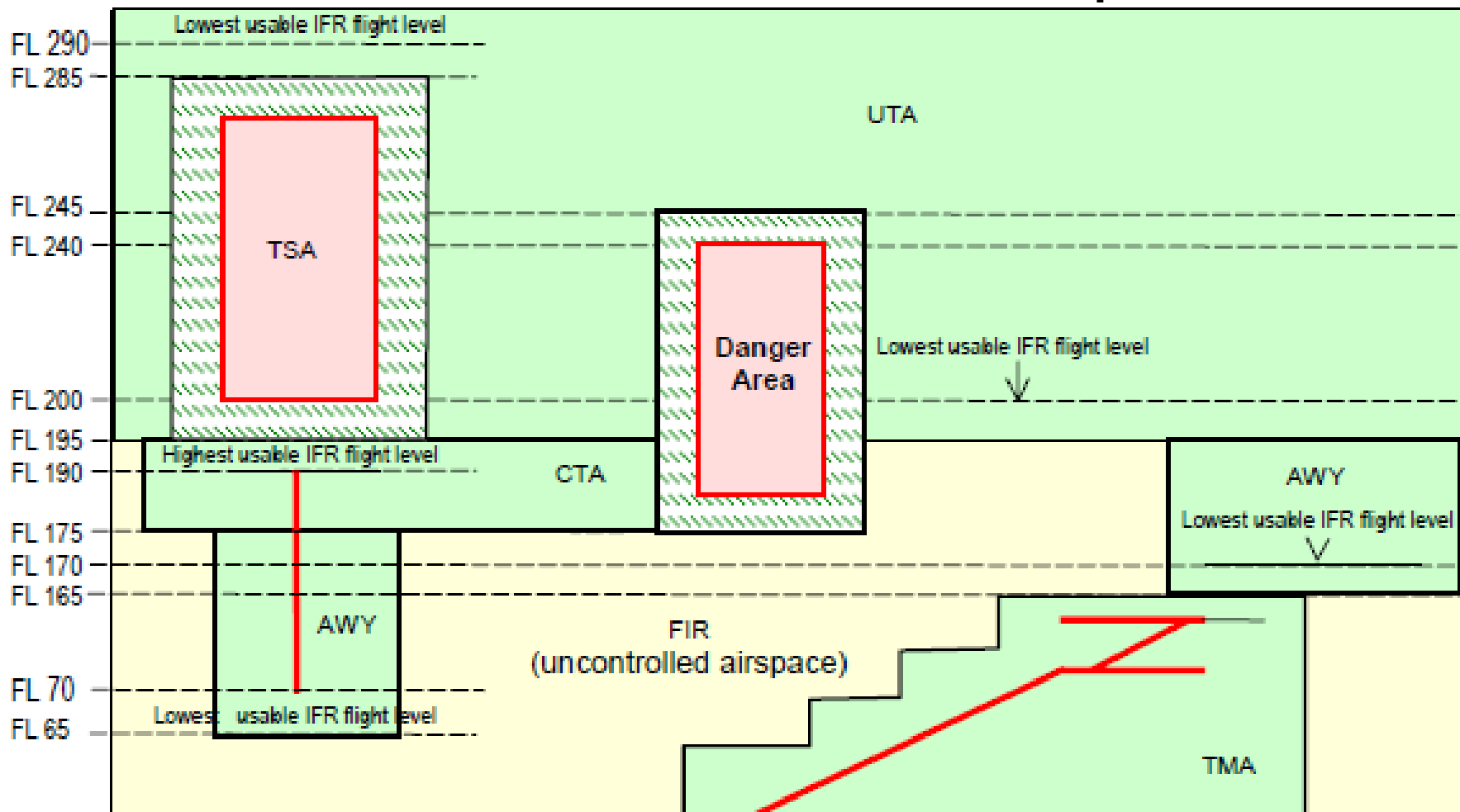
Illustration of Lateral Delineation of Airspace



Good Design Practice - Sectorisation



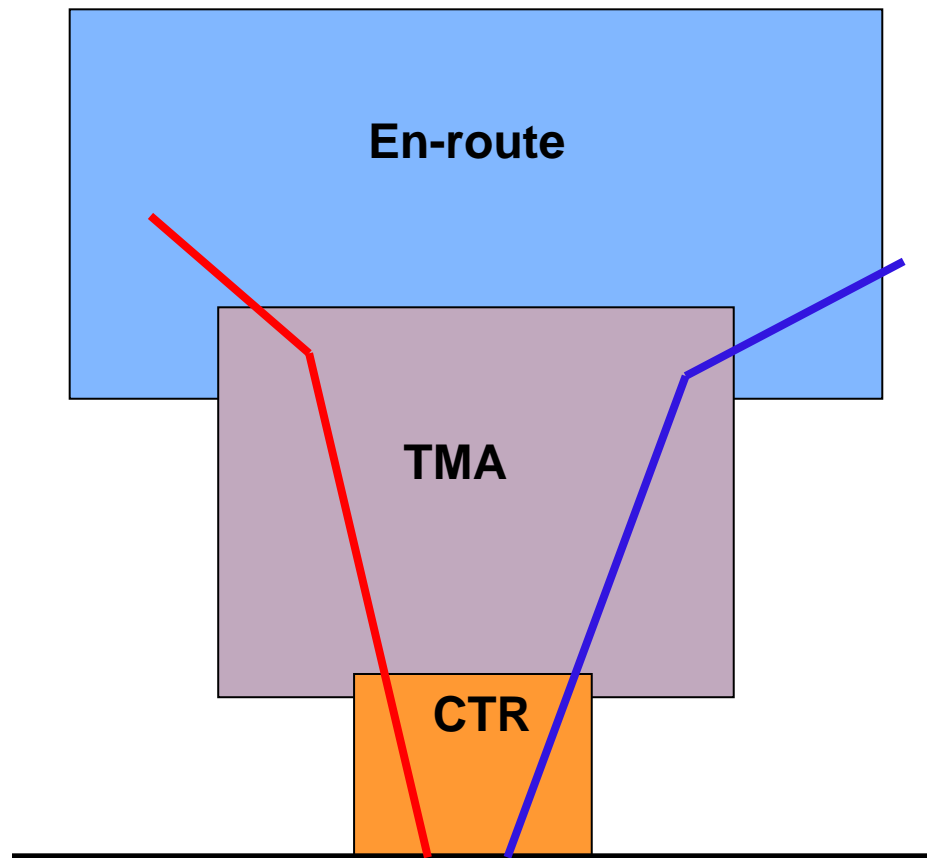
Illustration of Vertical Delineation of Airspace



Terminal Control Area (TMA)



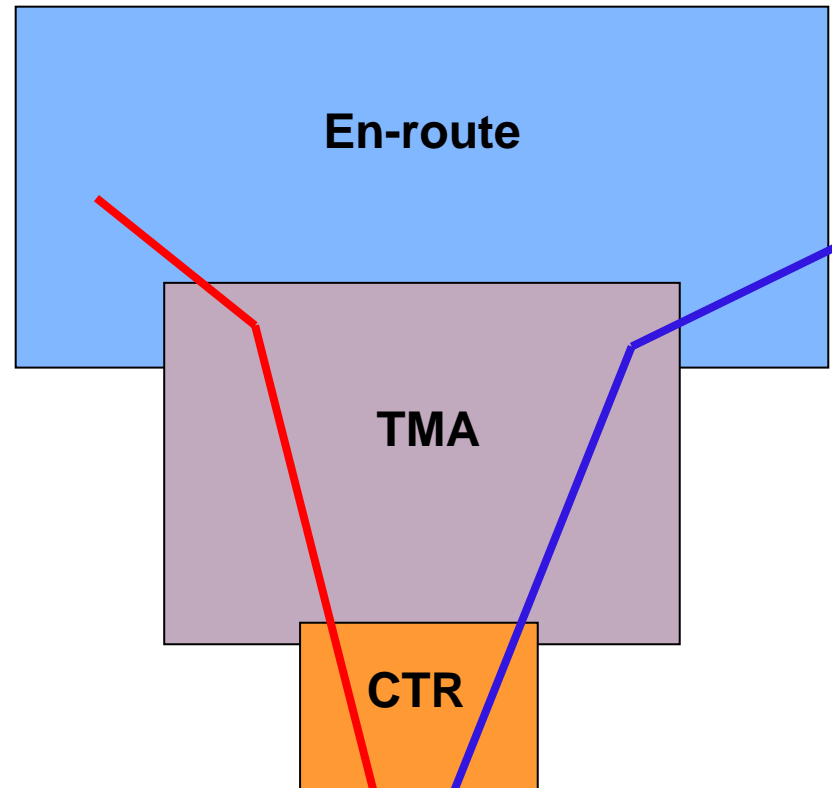
A control area is normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes. [Doc. 4444]



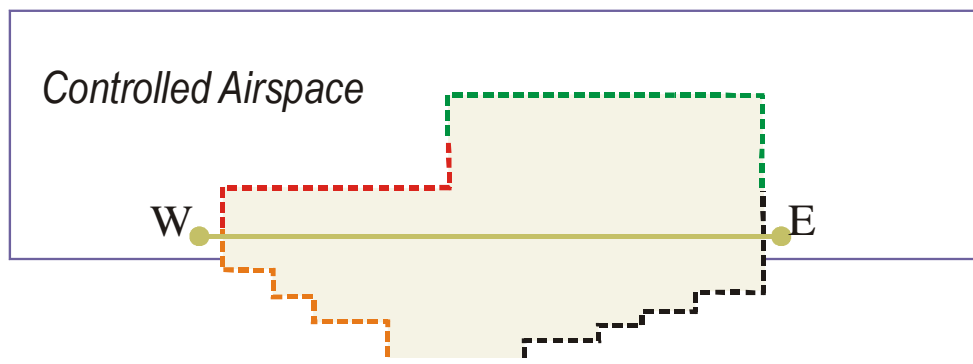
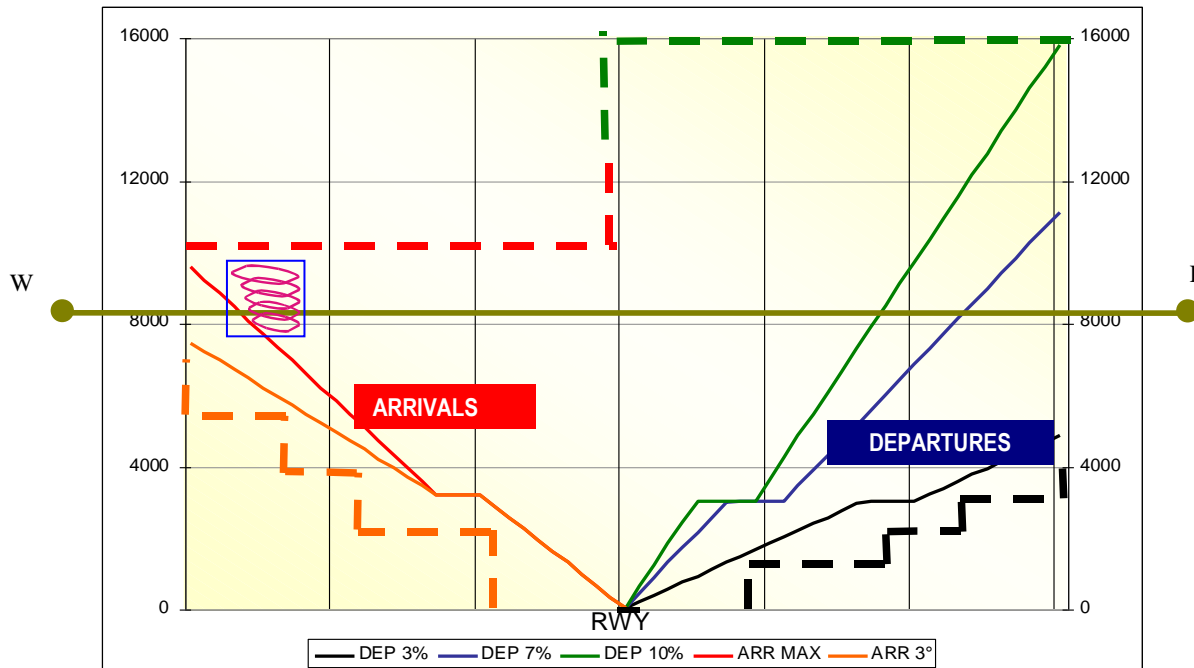
Terminal Airspace



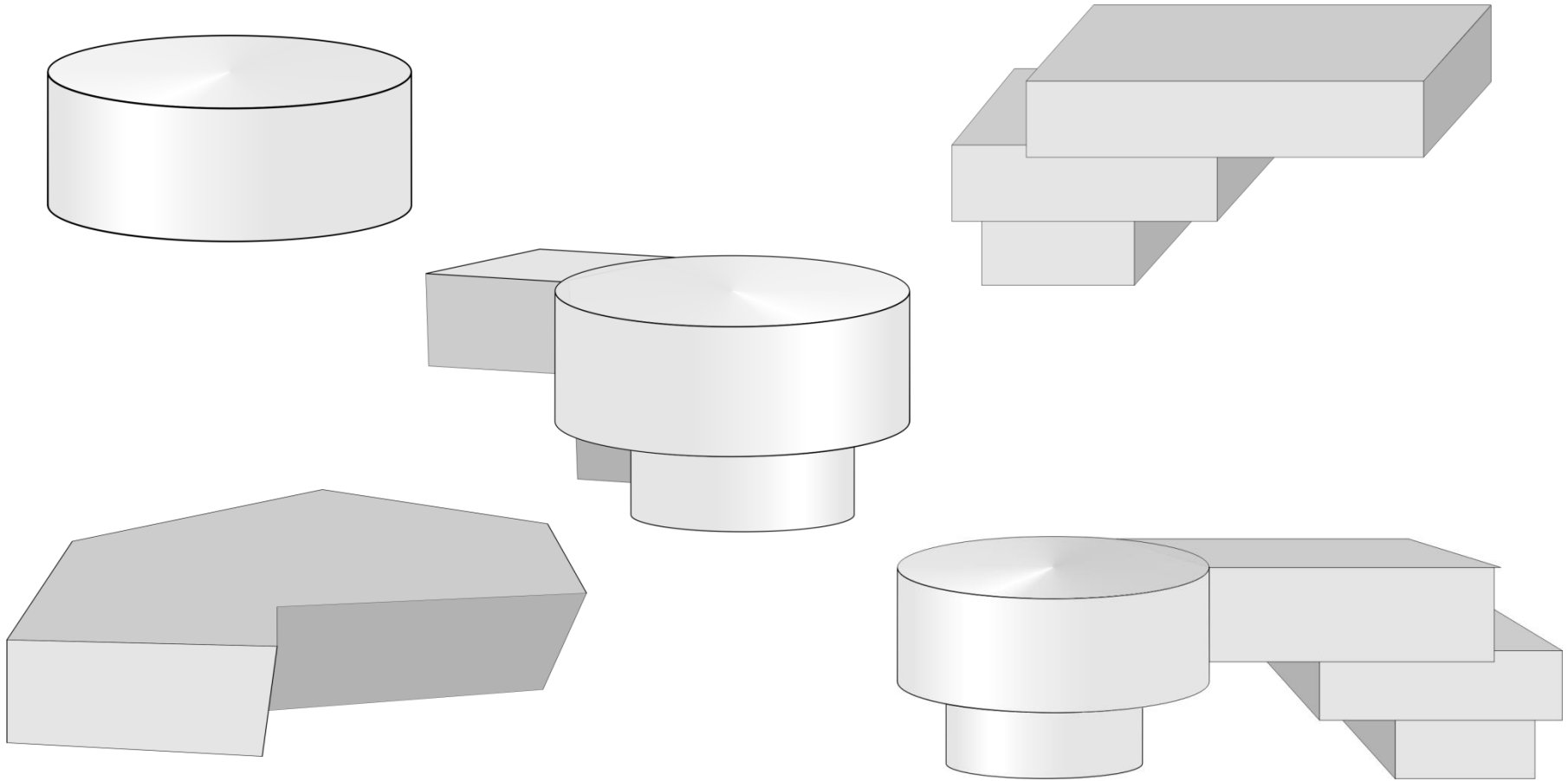
A generic term describing airspace surrounding an airport, within which air traffic services are provided. Such airspace predominantly contains traffic operating along SIDs and STARs or, to a lesser extent, ATS Routes of the ATS Route Network.



Airspace Volumes



Airspace Volumes from simple to complex

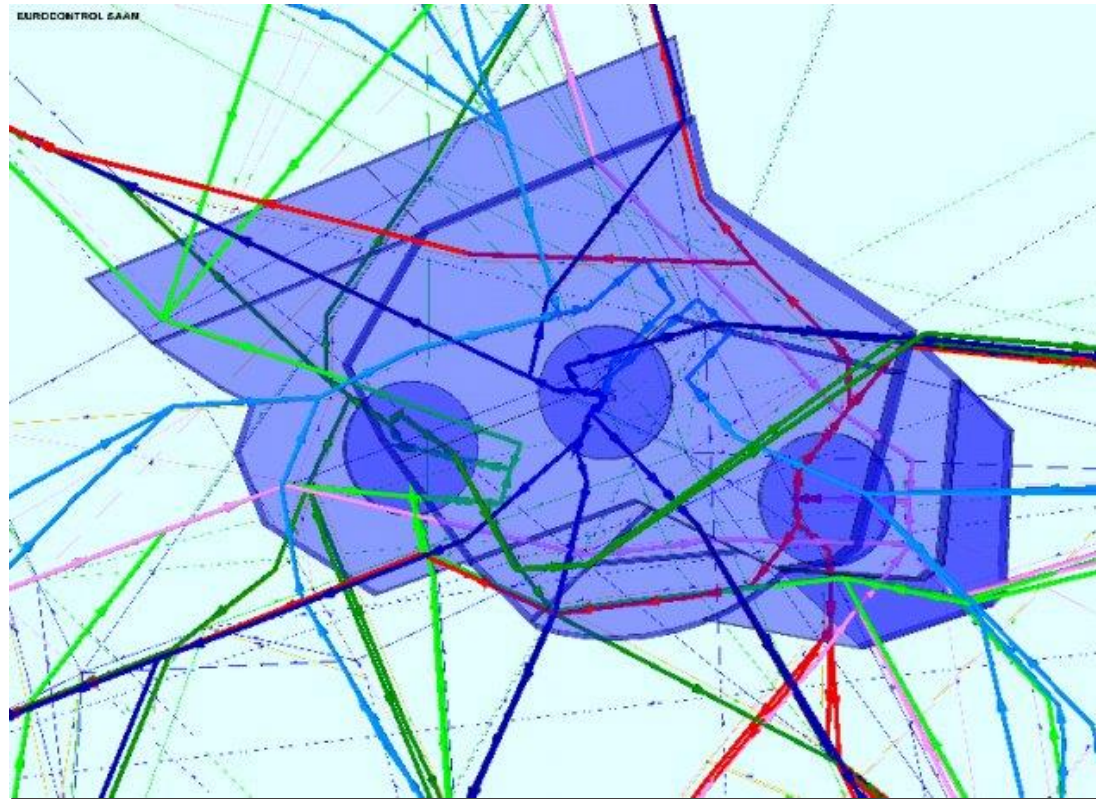


Terminal Airspace System

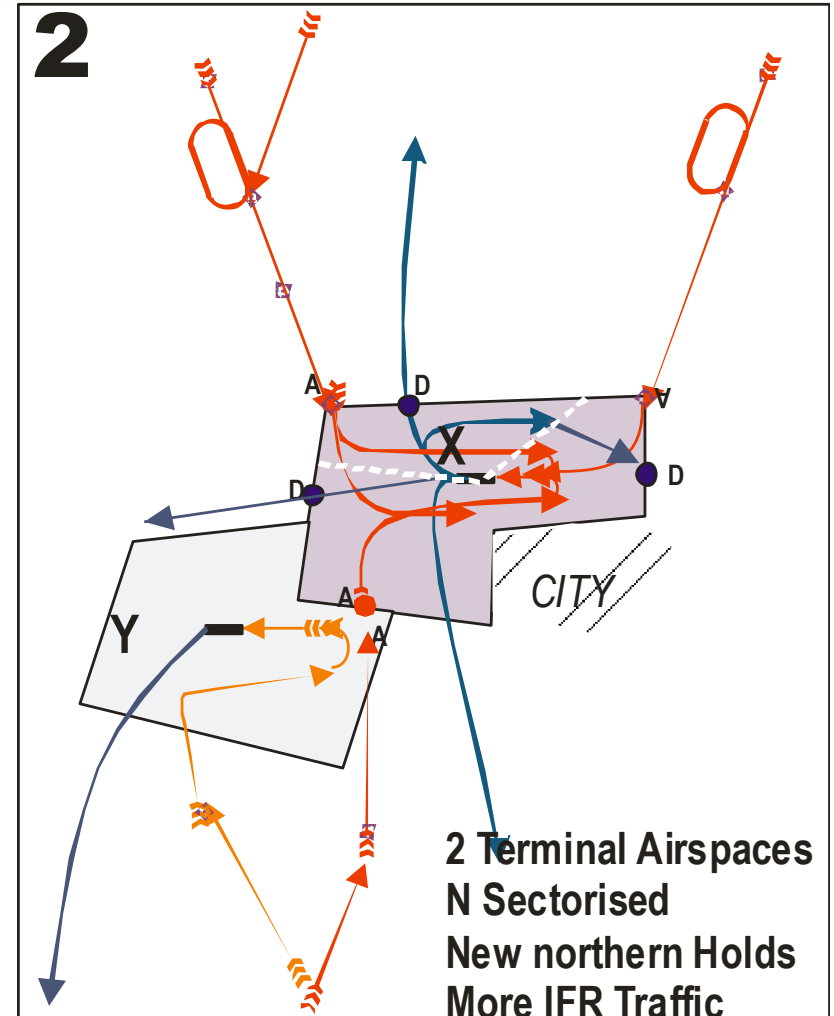
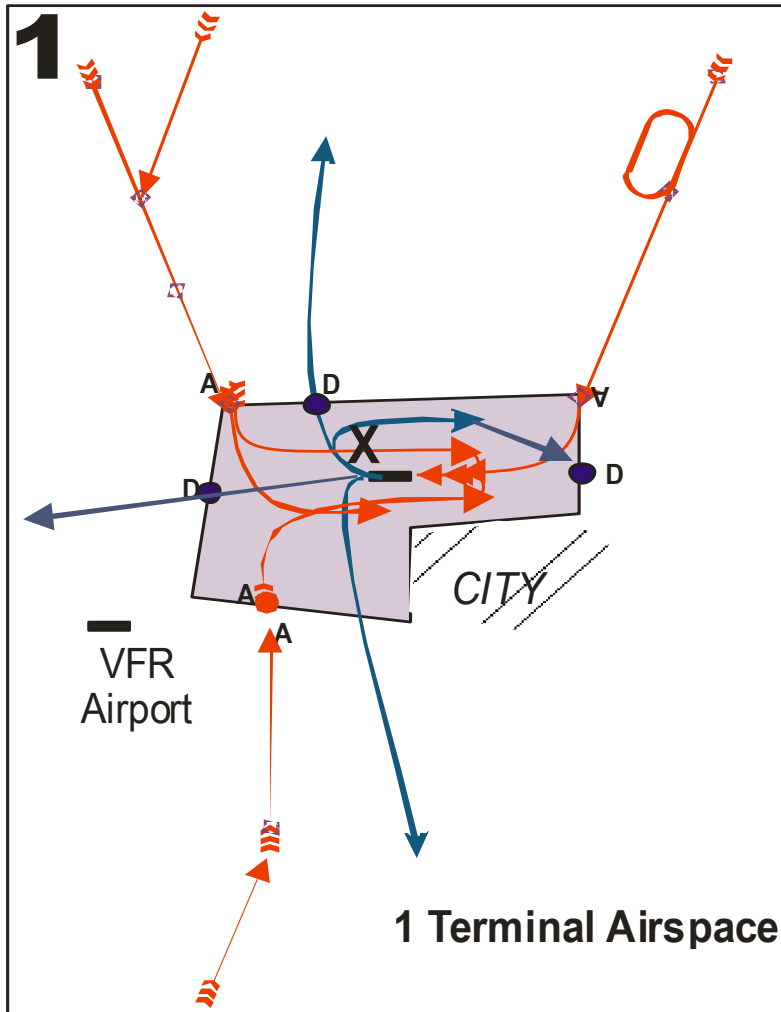


Combines two or more terminal airspace volumes servicing several airports in close proximity

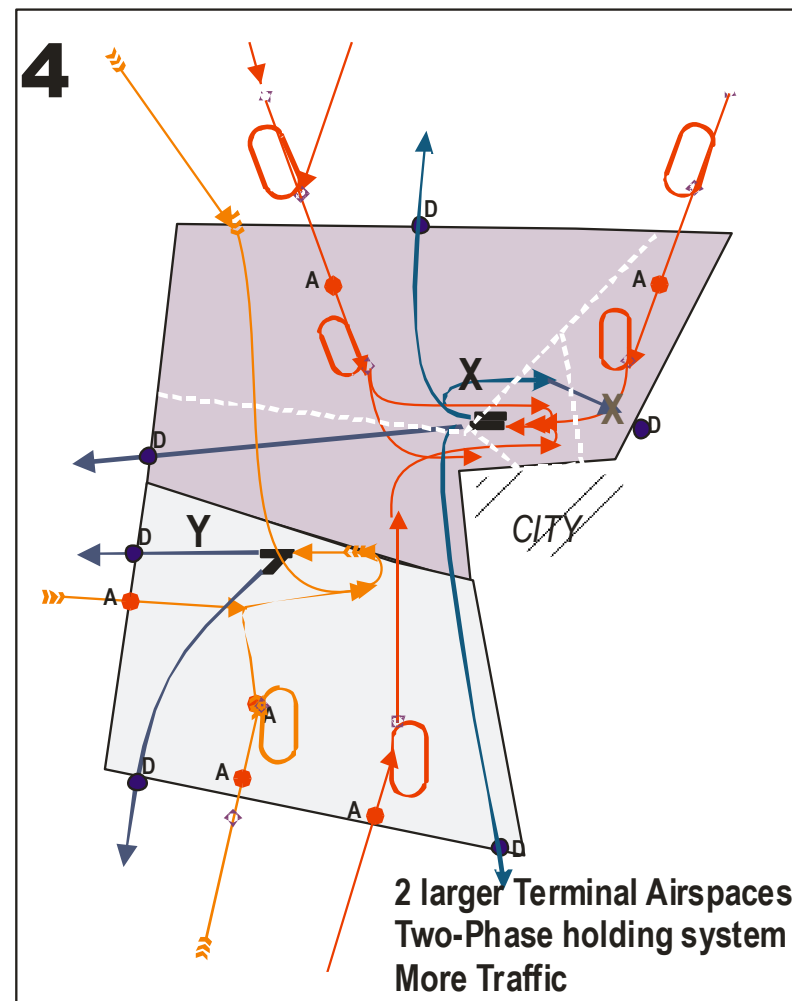
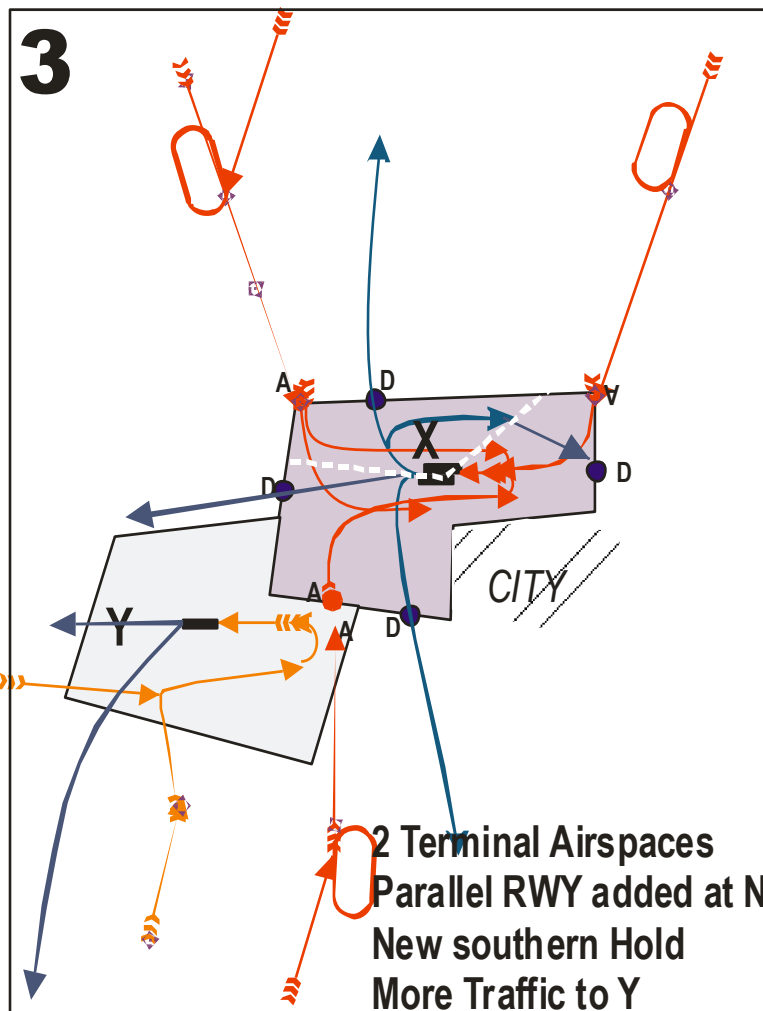
Allows improvement of the design and management of terminal routes and ATC sectorisation



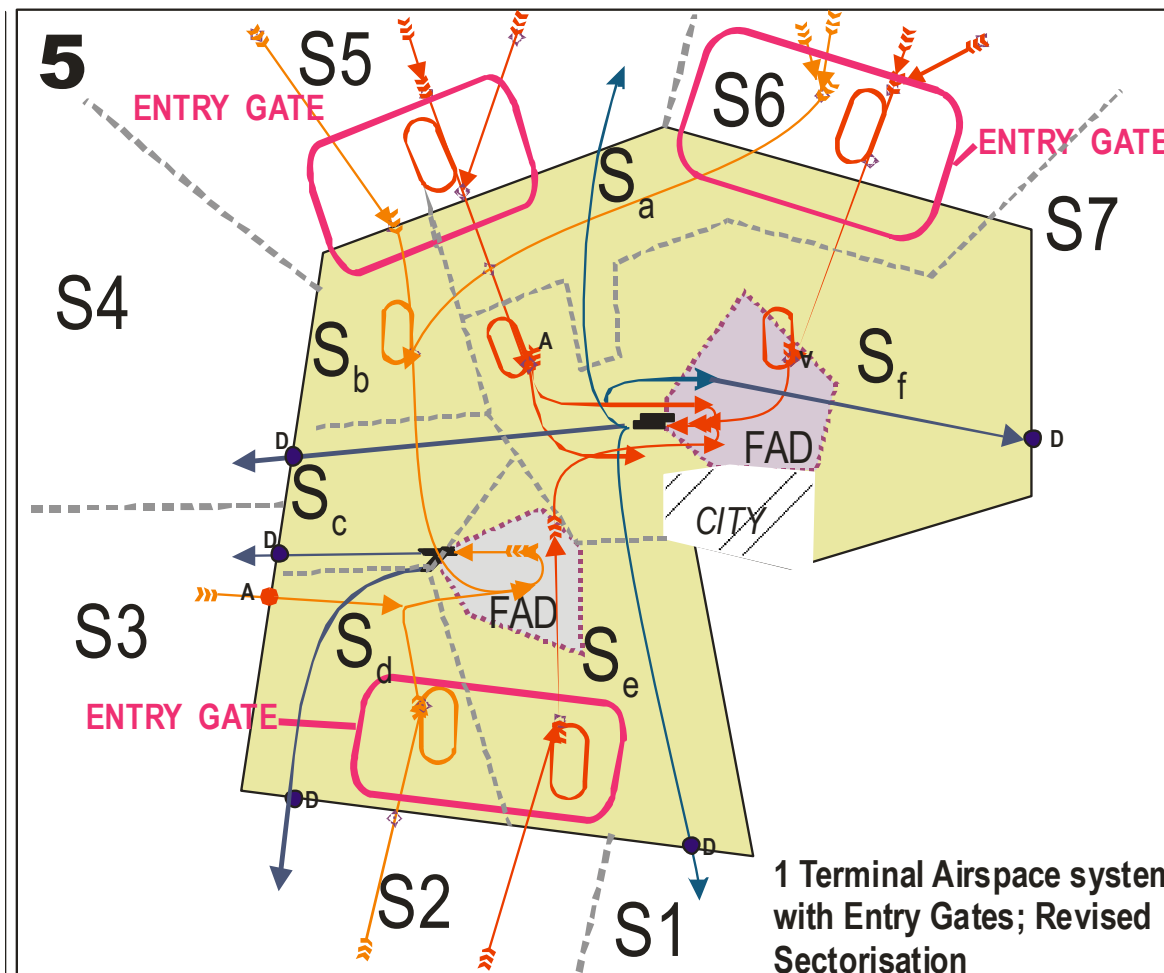
Terminal Airspace System



Terminal Airspace System



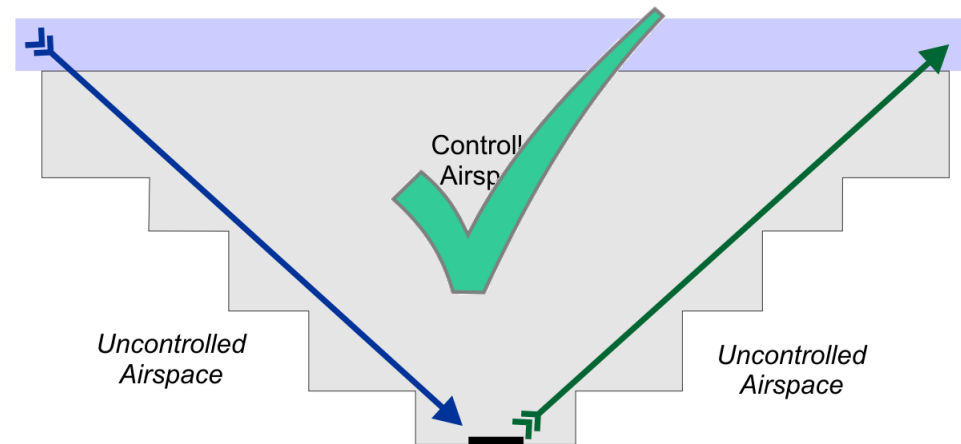
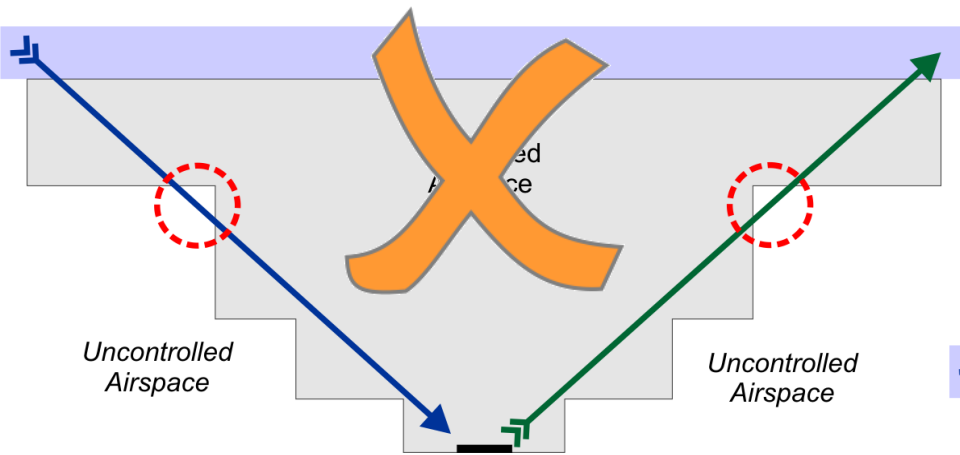
Terminal Airspace System



Airspace Volumes



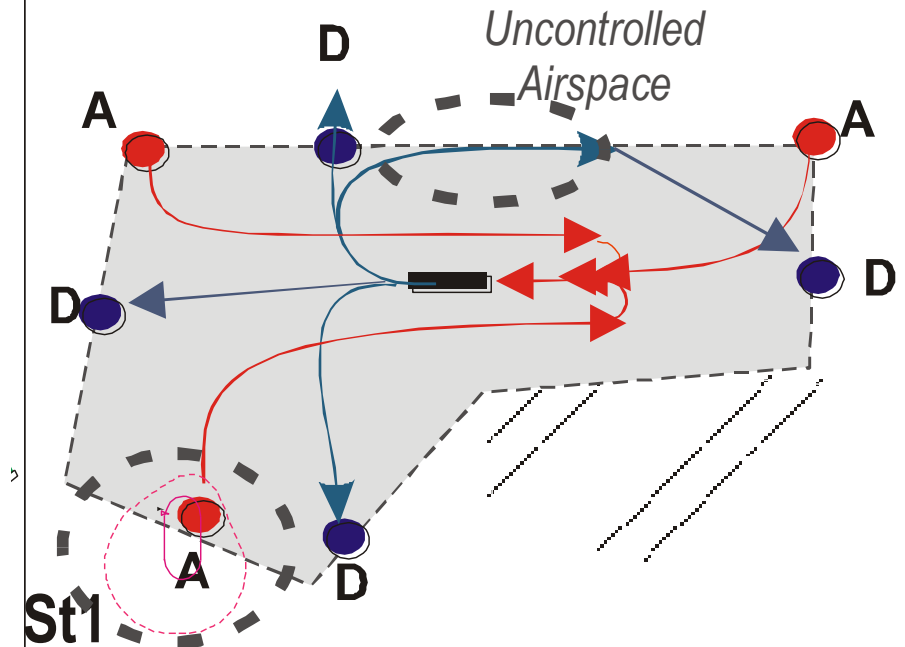
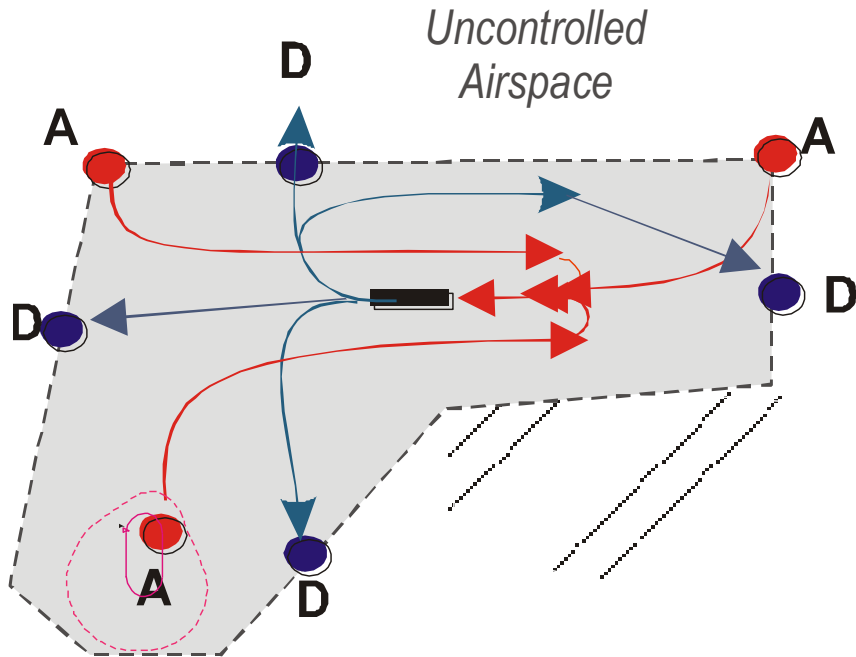
Protect IFR Flight Paths



Airspace Volumes

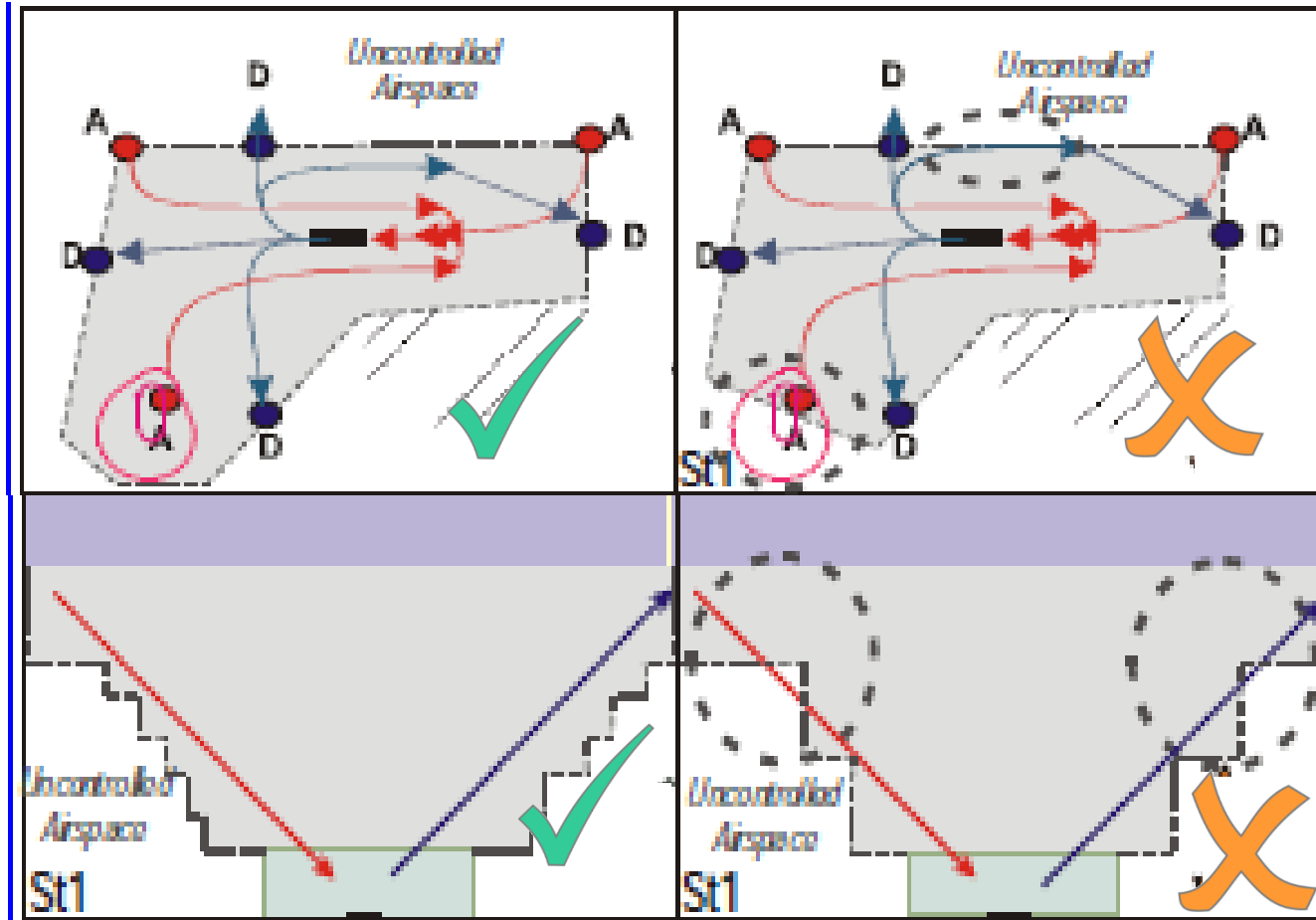


Protect IFR Flight Paths



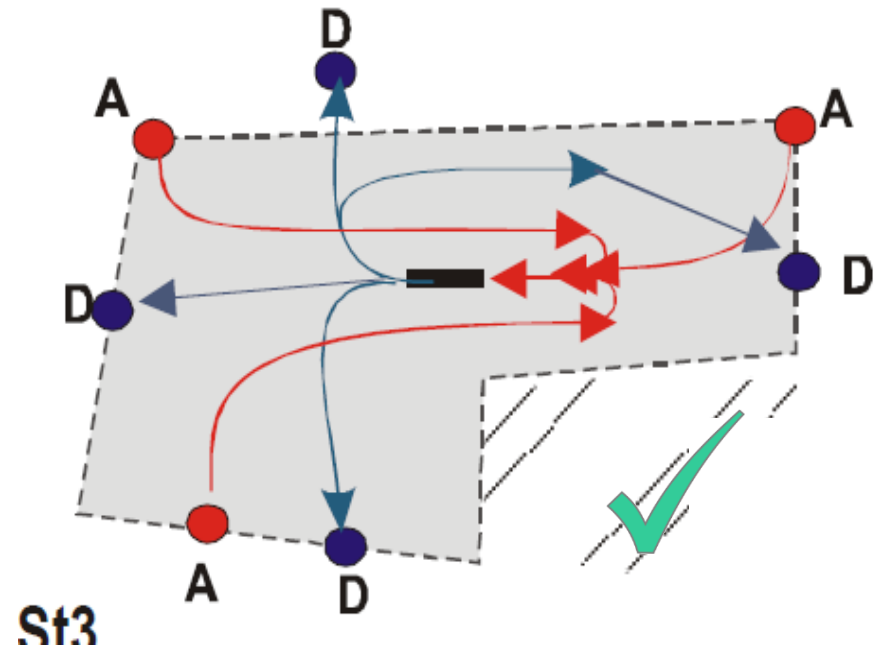
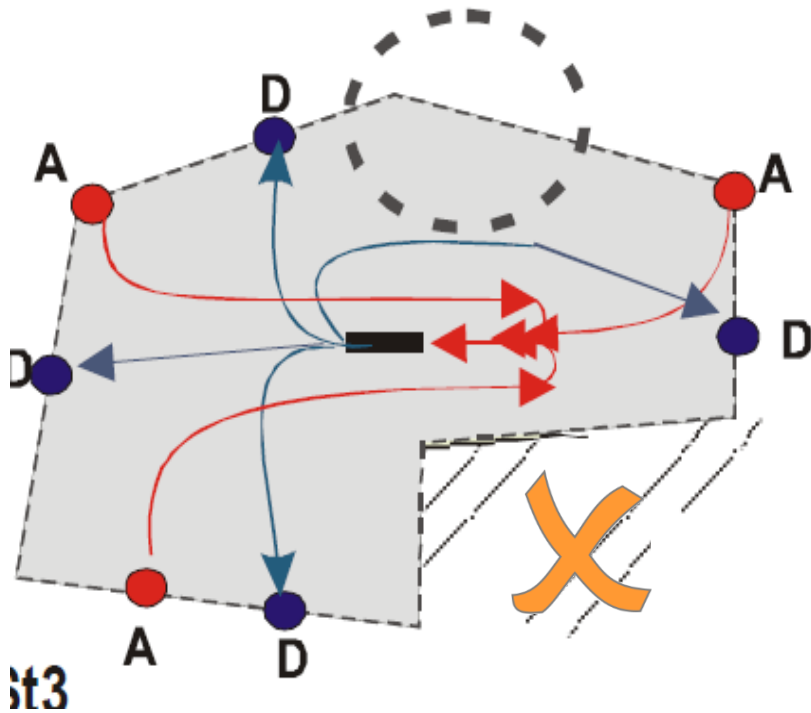
Airspace Volumes

Protect IFR Flight Paths

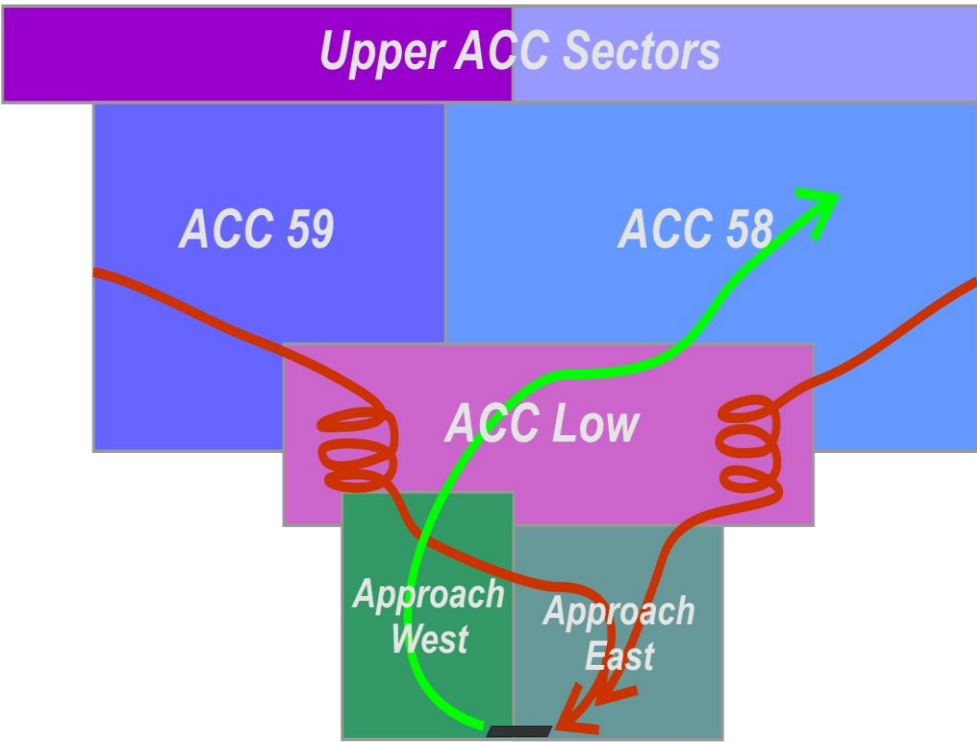


Airspace Volumes

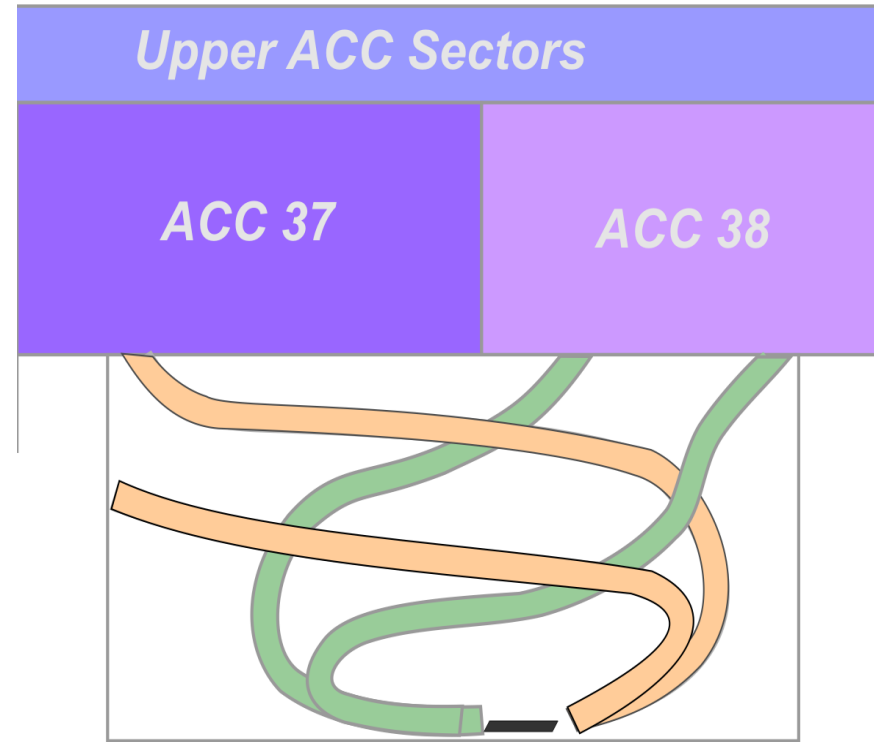
Do not take more airspace than needed....



Airspace Sectorisation



GEOGRAPHIC



FUNCTIONAL

Geographical Sectorisation



Advantages

- **ATC fully exploit space available and expedite climb and descent without need for co-ordination**
- **Easier to balance workload between sectors**
- **Simpler requirements for radar display and ATC systems**
- **Easy to describe operational instructions for different areas of responsibility**

Disadvantages

- **Mixed traffic – departures, arrivals and transits**
- **If sector boundary along runway centreline, departing aircraft go to different controllers depending on direction of travel**
- **Transit aircraft may require co-ordination if passing through multiple sectors**

Functional Sectorisation



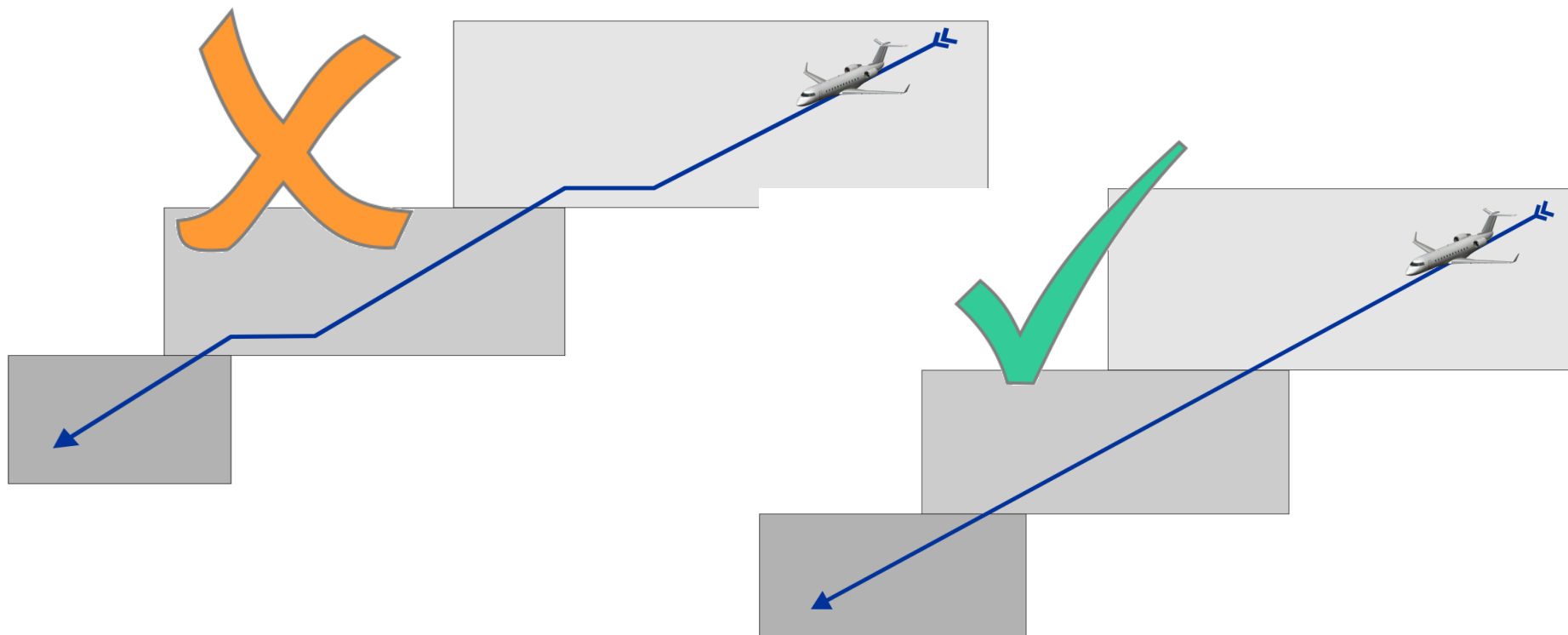
Advantages

- **One traffic type per controller – all arrivals or all departures**
- **All departing aircraft usually on same frequency after take-off**
- **Can be more flexible in some circumstances**

Disadvantages

- **Vertical limits can be restrictive as unlikely to cater for all aircraft types**
- **Workload balance difficult especially where arrival and departure peaks do NOT coincide**
- **Can place demanding requirements on Radar and ATC systems**
- **Can be difficult to describe operational instructions for different areas of responsibility**

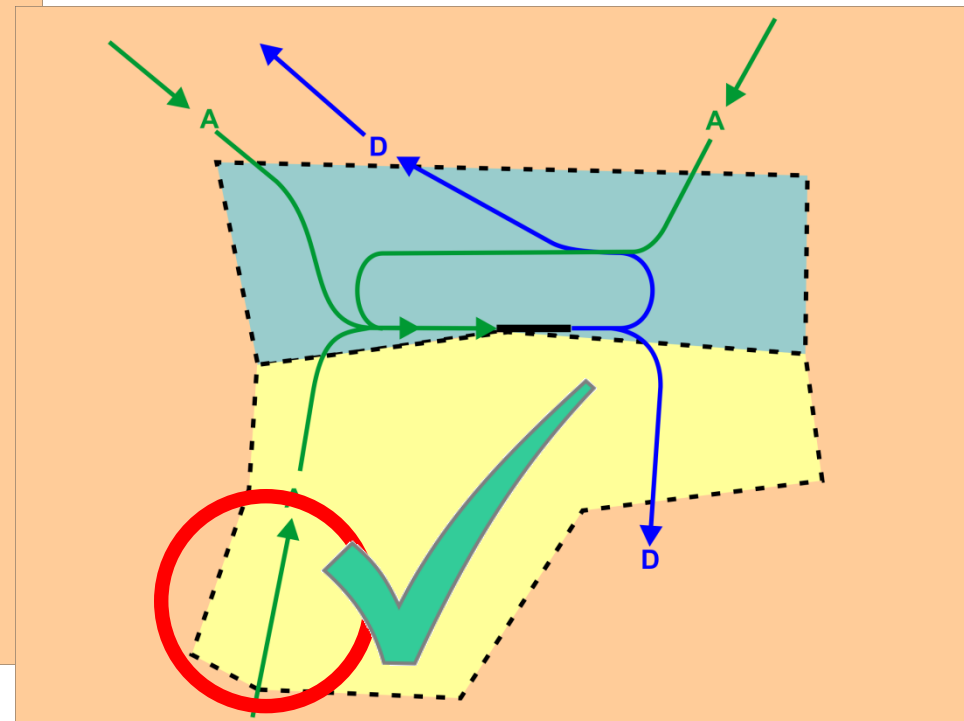
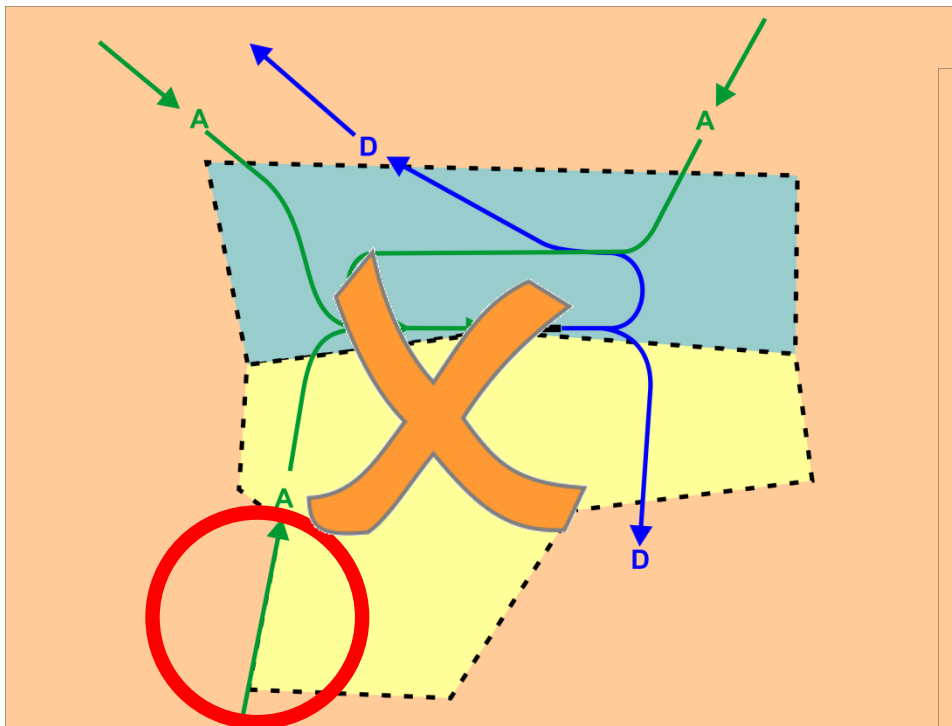
Avoid Sector designs that cause stepped climbs or descents



ATC Sectorisation



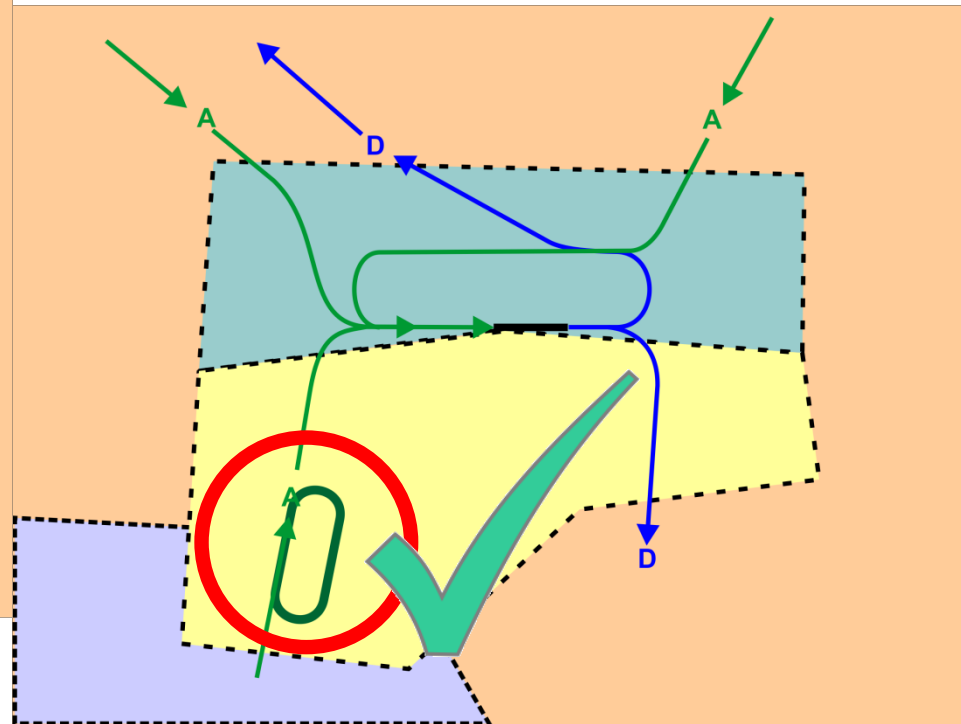
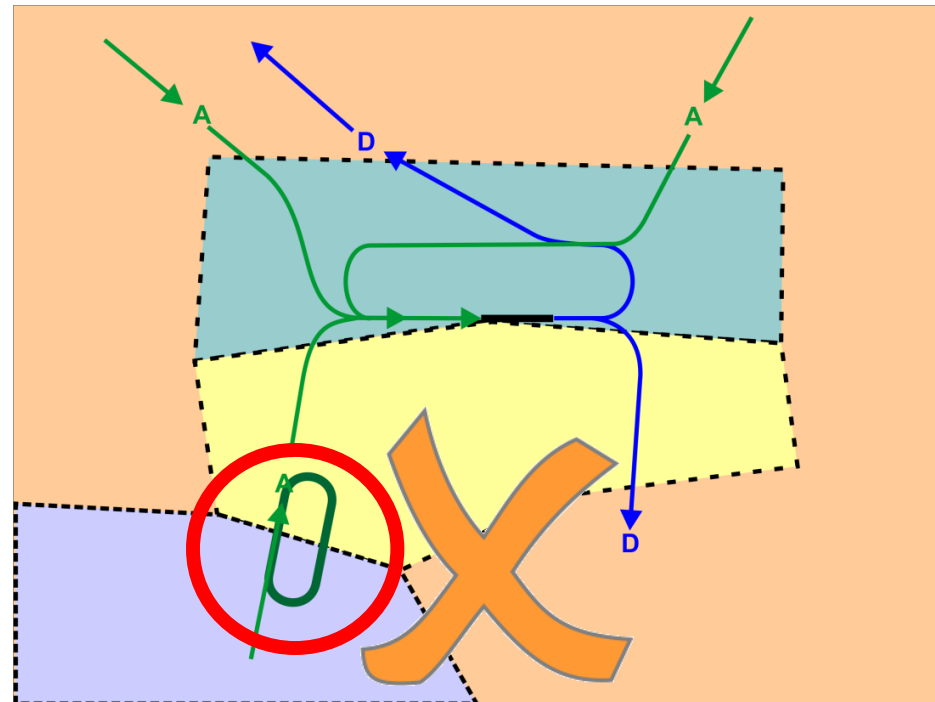
Sector boundaries should not coincide with route center lines



ATC Sectorisation



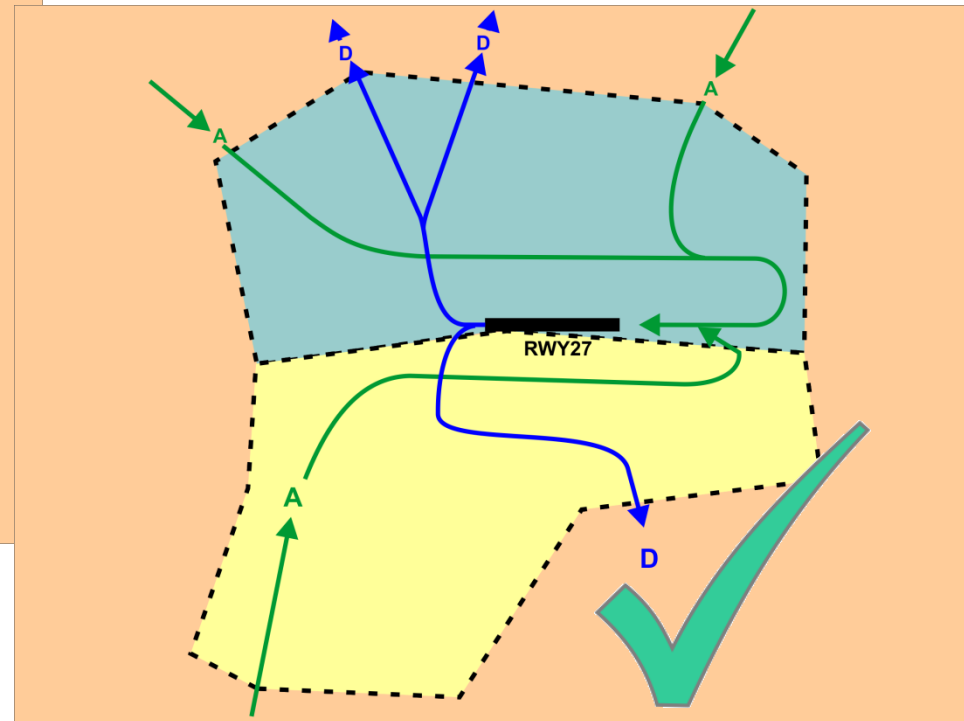
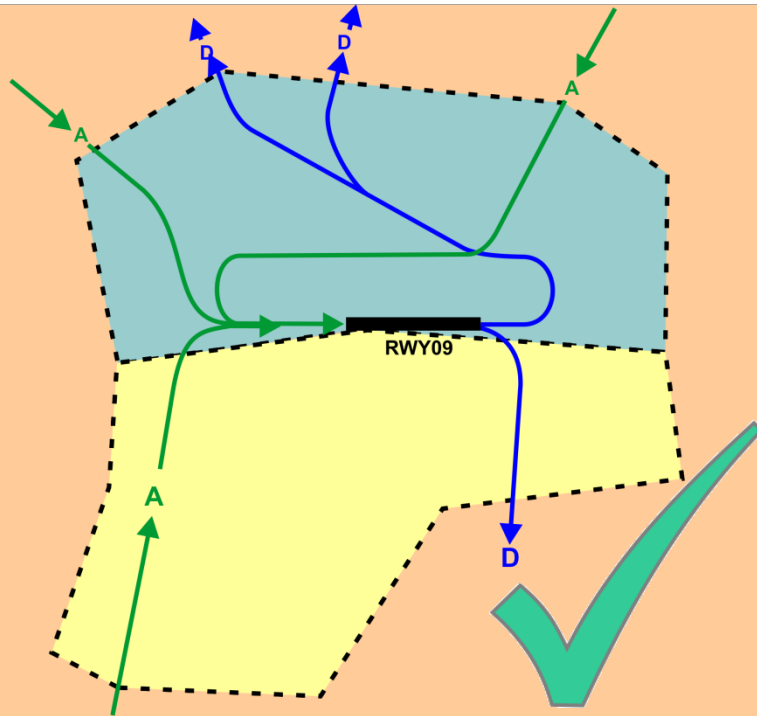
Maintain holding area in same sector



ATC Sectorisation



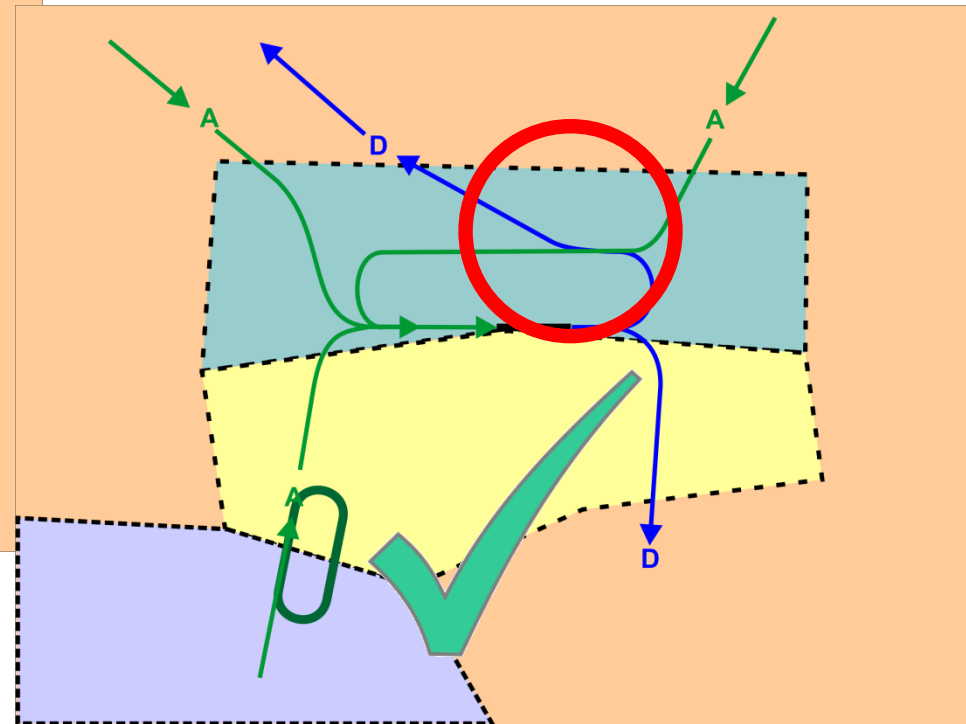
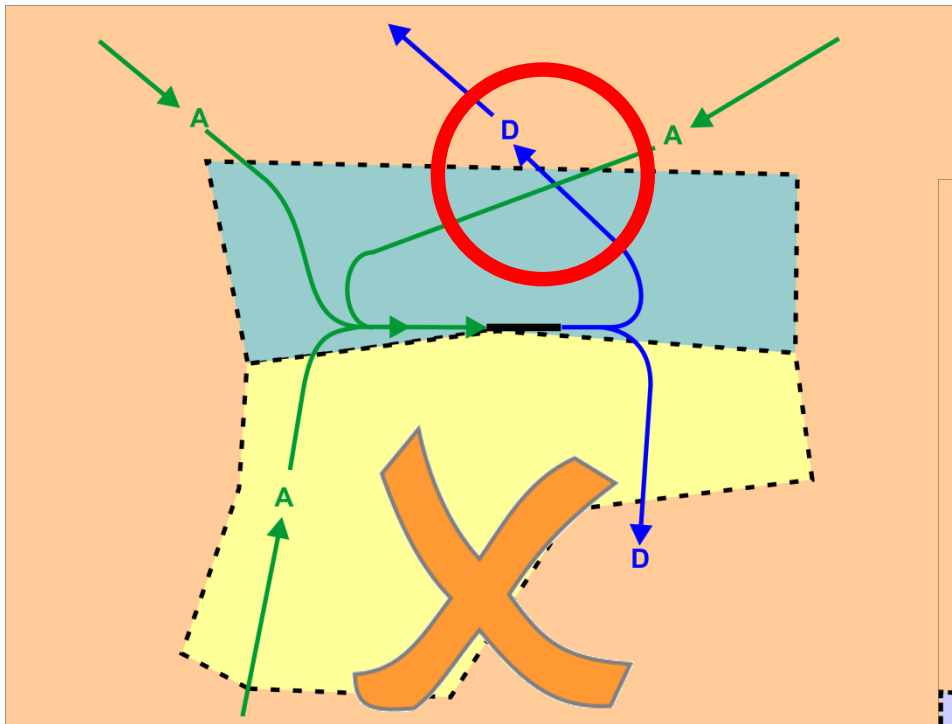
If able, keep sectors the same when runway changes



ATC Sectorisation



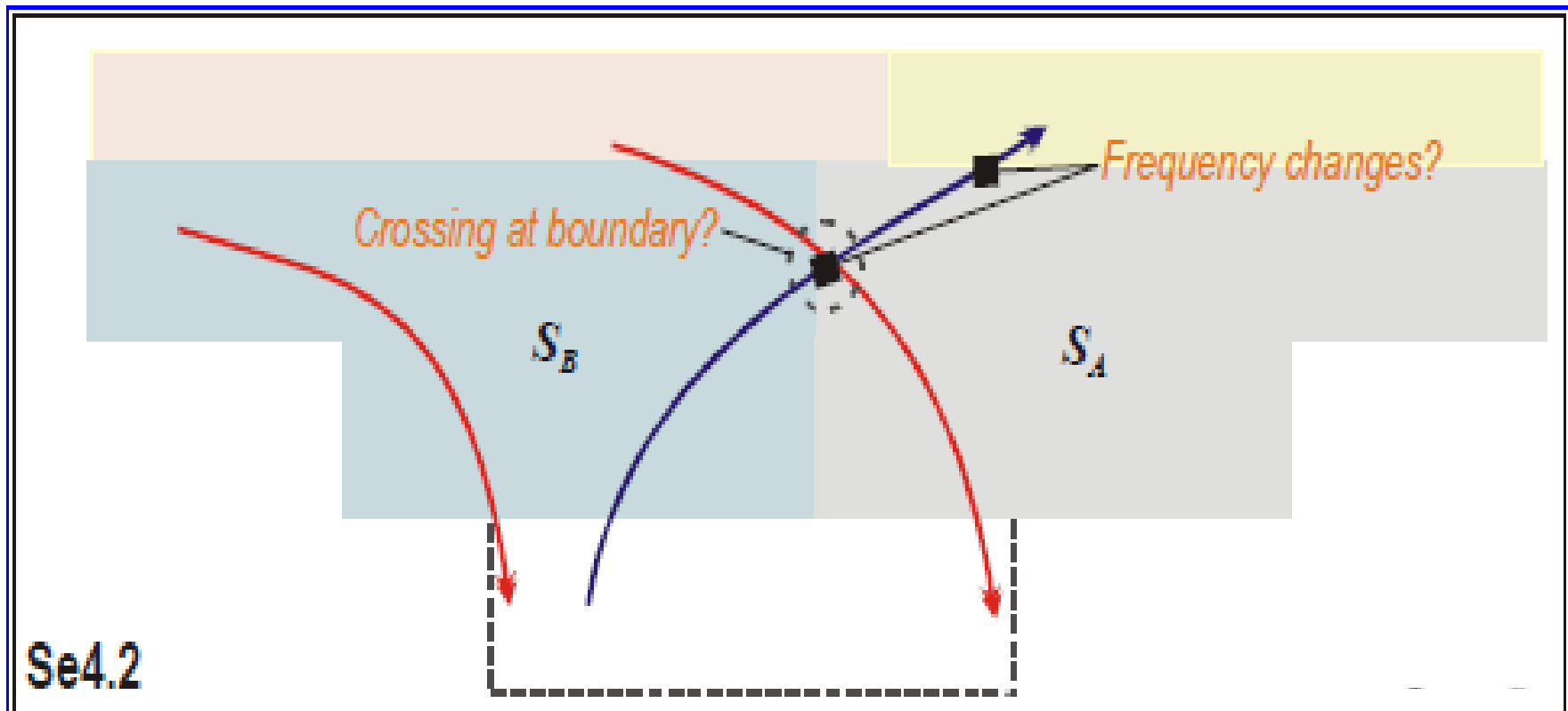
Avoid crossing too close to sector boundary



ATC Sectorisation



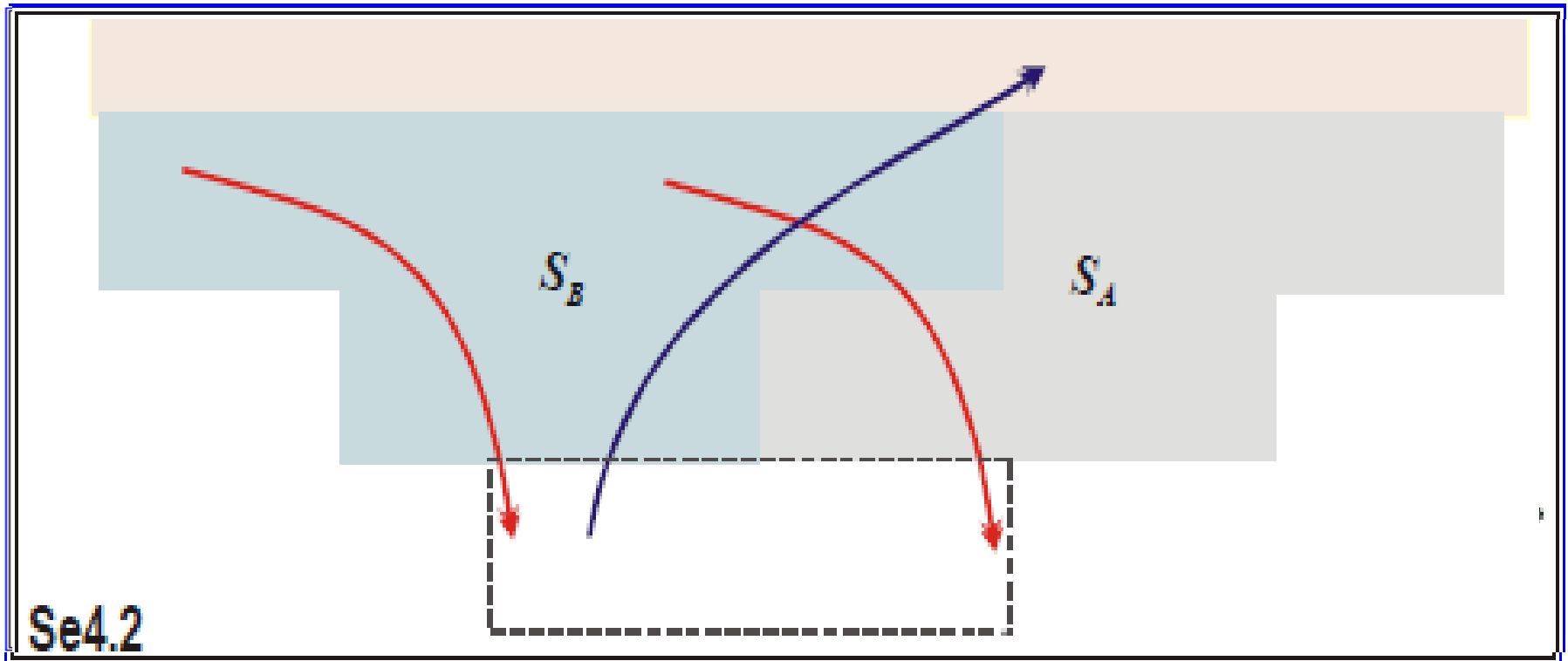
- Vertical limits of geographic sectors need not be uniform
 - Watch out for conflicts at boundaries



ATC Sectorisation

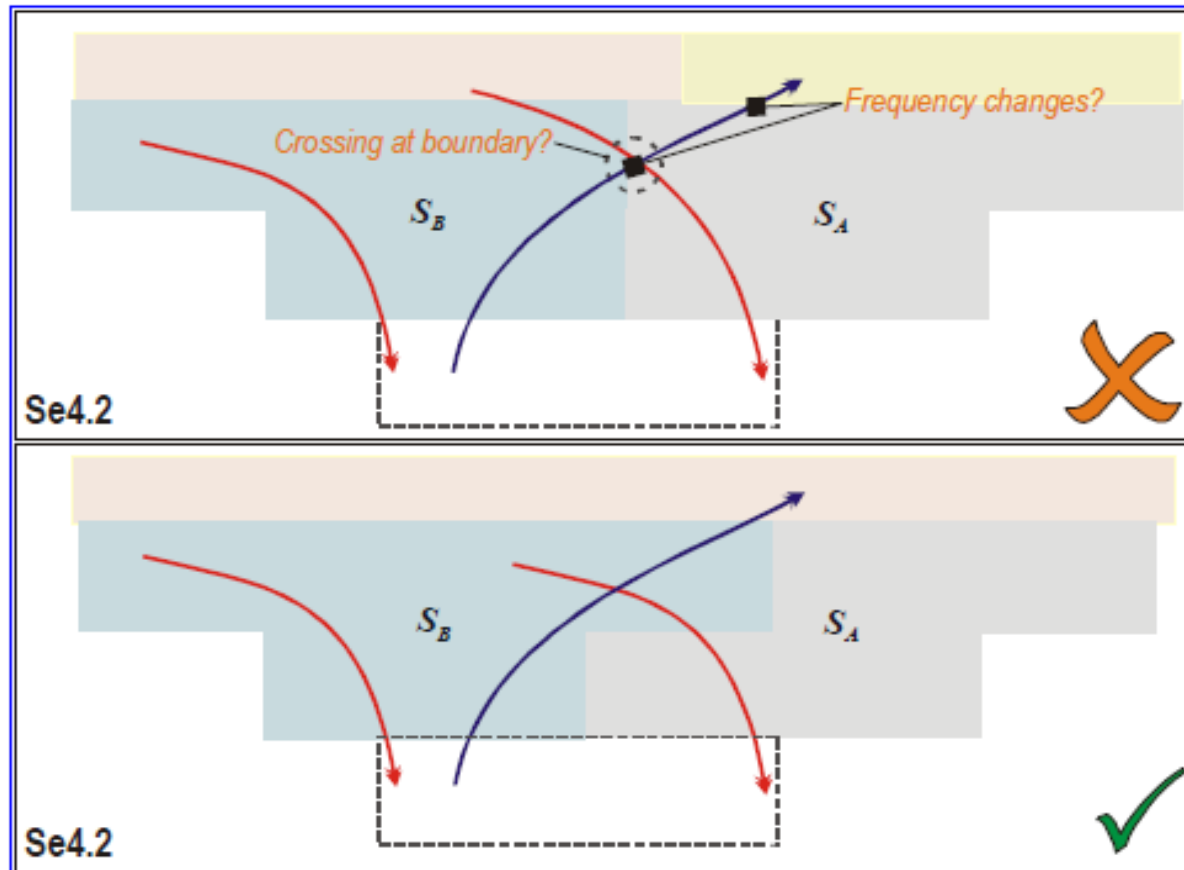


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ATC Sectorisation

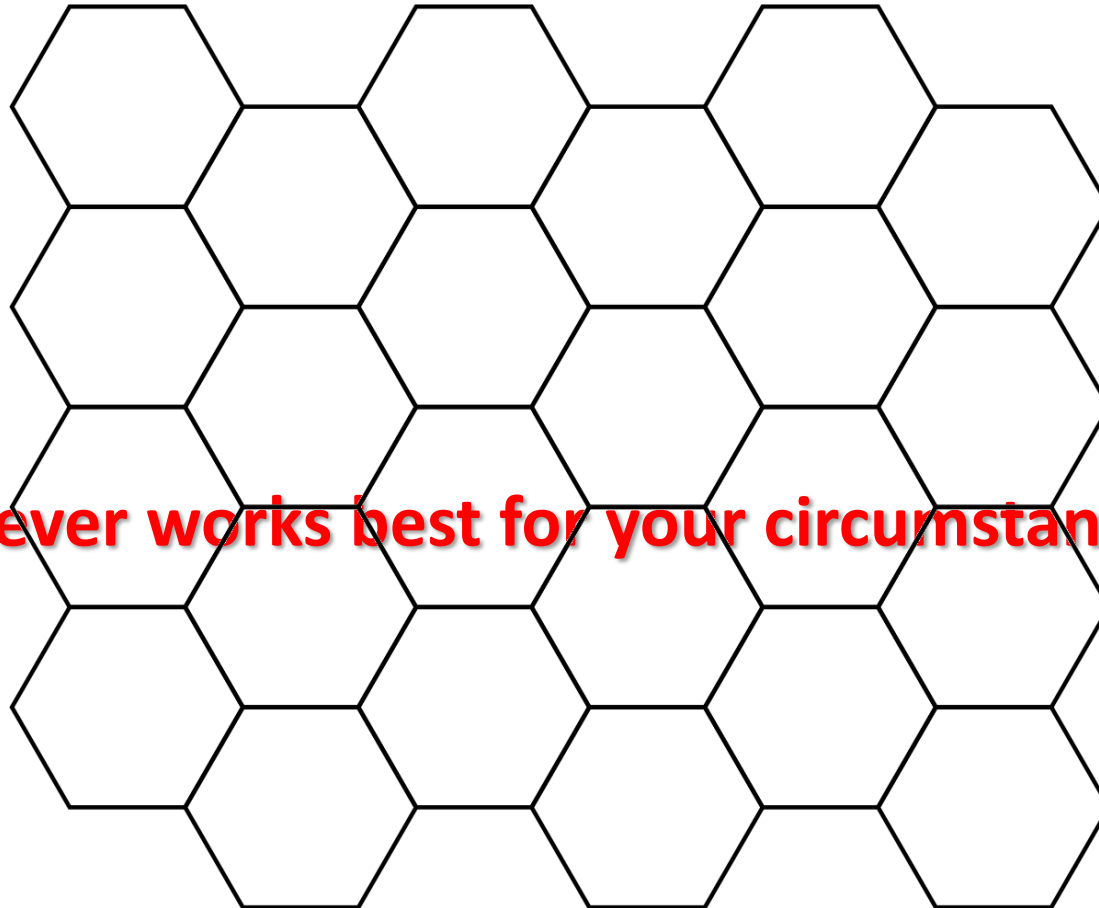
- Vertical limits of geographic sectors need not be uniform
 - Watch out for conflicts at boundaries



ATC Sectorisation



What is a good Airspace Design?



Whatever works best for your circumstances.



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

Asia and Pacific
Regional Sub-Office
Beijing (APAC RSO)

Questions?



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
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Thank You