

Regional Focus



# CANSO / ICAO Joint Workshop on Aviation System Block Upgrades (ASBU) Part 3

Wednesday 7 October 2020

14:00 – 16:00 CEST



**Ms. Boni Dibate**

**Director Africa Affairs**

**CANSO**



**Ms. Keziah Ogutu**

**Regional Officer, Air Traffic  
Management**

**ICAO - ESAF**



# Mr. Pwajok Matthew Lawrence

Director of Operations

NAMA



# ASBU Overview, CCO/CDO & Free Routing



1

## CANSO Workshop

### ASBU Overview, CCO, CDO and Free Routing

7th October 2020



# ASBU Overview, CCO/CDO & Free Routing



## Presentation By NAMA



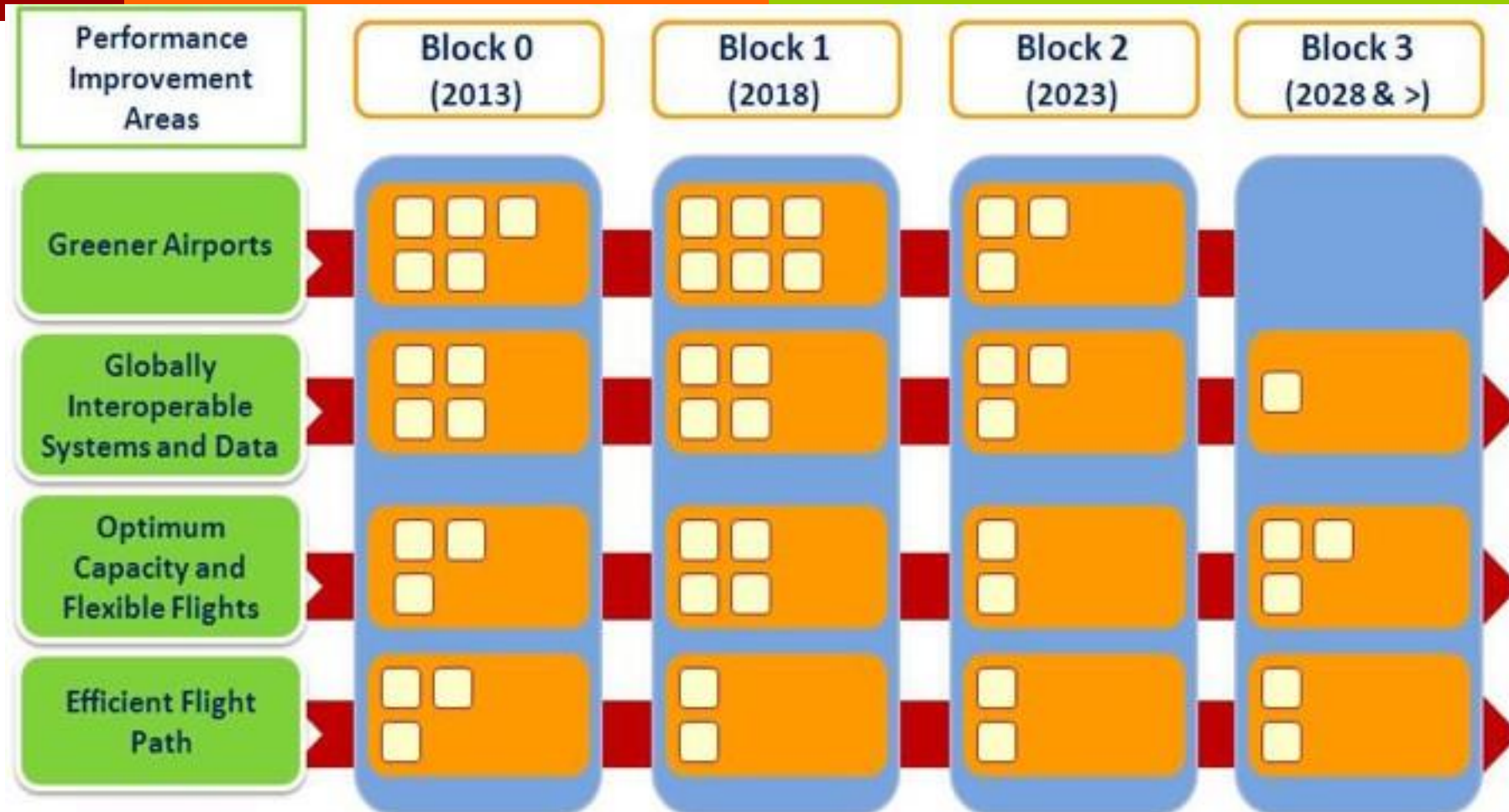




# ASBU Overview, CCO, CDO & Free Routing



## ASBU Block 0 Modules 2013 - 2018

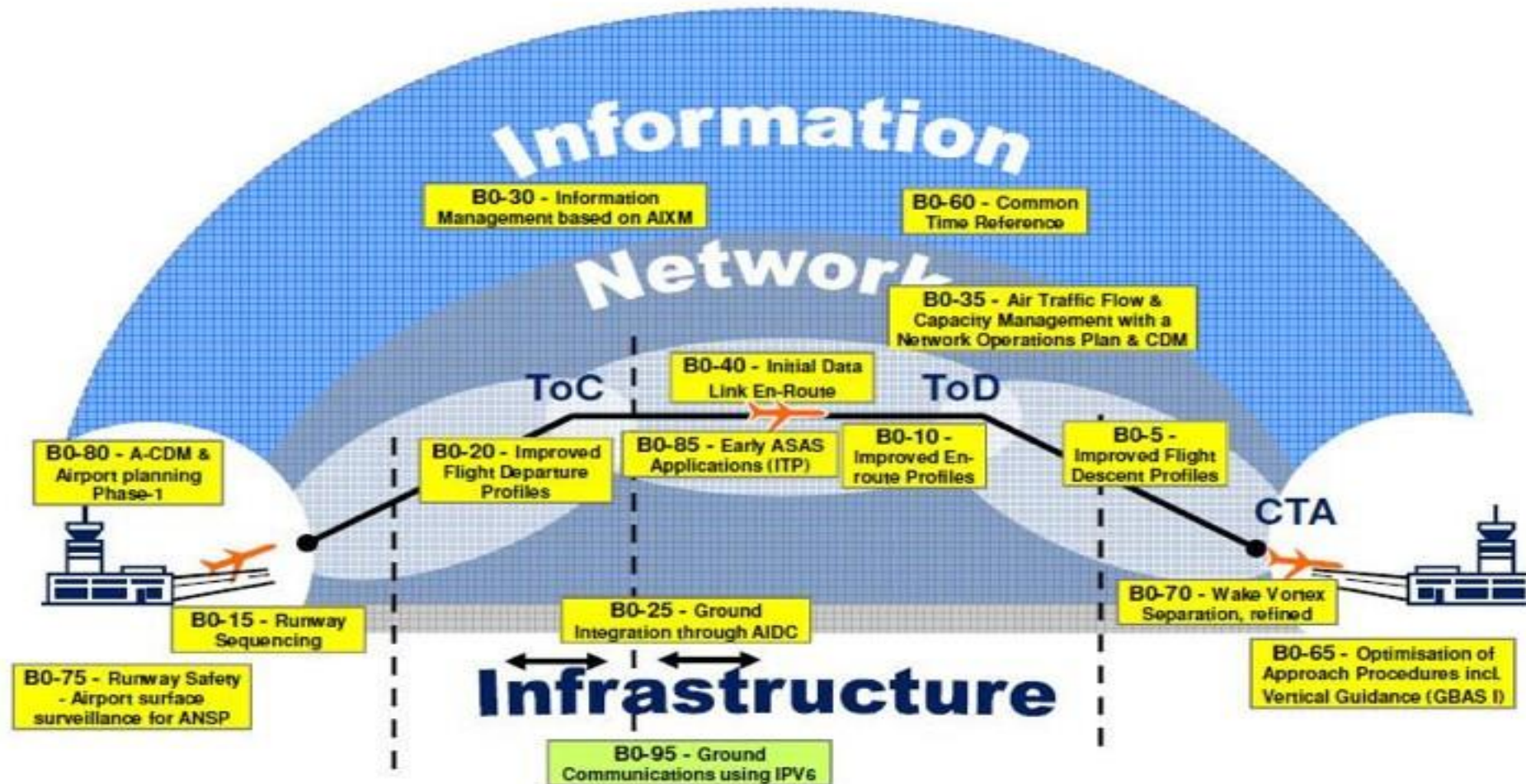




# ASBU Overview, CCO, CDO & Free Routing



## ASBU Block 0 Modules







# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-RSEQ Improved Traffic Flow through Runway Sequencing (AMAN/DMAN)

### Performance Improvement Area 1: Airport Operations

#### 3. ASBU B0-RSEQ: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>N</i>

#### 4. ASBU B0-15/B0-RSEQ: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. AMAN and time-based metering (Lagos and Abuja airport)</i>	<i>December 2017 – To be implemented at Lagos and Abuja</i>
<i>2. Departure Management (Lagos and Abuja Airport)</i>	<i>December 2017 – To be implemented at Lagos and Abuja</i>
<i>3. Movement Area Capacity Optimization (Lagos and Abuja airport)</i>	<i>Surface Movement and Ground Control Services implemented in Lagos on 13<sup>th</sup> November 2014 and in Abuja in May 2015.</i>



# ASBU Overview, CCO, CDO & Free Routing



## NATIONAL PERFORMANCE OBJECTIVE:

Performance Improvement Through B0-65/APTA: Optimization of Approach Procedures Including Vertical Guidance

### Performance Improvement Area 1: Airport Operations

#### *ASBU B0-65/APTA: Impact on Main Key Performance Areas (KPA)*

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>

#### *ASBU B0-65/APTA: Planning Targets and Implementation Progress*

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. APV with Baro VNAV</i>	<i>December 2017 – Service Providers and user</i>
<i>2. APV with SBAS</i>	<i>Collaborating with SAFIR and the Nigerian Space Research and Development Agency for implementation in December 2018</i>
<i>3. APV with GBAS</i>	<i>December 2018 – Initial implementation.</i>
<i>4. LPV, SIDs and STARs</i>	<i>LPV implemented at 24 airports (4 SIDs &amp; STARs).</i>



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-70/WAKE Improved Runway Throughput, Through Wake Turbulence Separation

### Performance Improvement Area 1: Airport Operations

### 3. ASBU B0-70/WAKE: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>Y</i>	<i>N</i>	<i>Y</i>	<i>Y</i>

### 4. ASBU B0-70/WAKE: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. Revision of current ICAO wake separation minima</i>	<i>December 2018</i>
<i>2. Increasing Aerodrome Arrival Operational Capacity</i>	<i>December 2018</i>
<i>3. Increasing Aerodrome Departure Operational Capacity</i>	<i>December 2018</i>
<i>4.</i>	



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-75/B0-SURF

Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)

Performance Improvement Area 1: Airport Operations

### 3. ASBU B0-75/SURF: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	Y	Y	Y	Y	Y

### 4. ASBU B0-75/B0-SURF: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. Surveillance system for Surface Movement and Ground Control (PSR, SSR, ADS-B or MLAT)</i>	<i>December 2017 - To be implemented at Lagos and Abuja by Air Navigation Service provider (NAMA)</i>
<i>2. Surveillance system on board (SSR transponder, ADS-B capacity)</i>	<i>December 2017 Airlines, NCAA</i>
<i>3. Surveillance system for vehicles</i>	<i>December 2017 Airlines, NCAA, FAAN, NAMA</i>
<i>4. Visual aids for navigation (Approach and Runway Lights, PAPIS, Markings, Signage,)</i>	<i>Implemented at all international airports by Aerodrome Operator (FAAN)</i>
<i>5. Runway Incursion and Excursion (Runway Safety Team)</i>	<i>Local Runway Safety Teams established at Lagos, Abuja, Kano, Port and Enugu in 2016.</i>



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-80/B0-ACDM Improved Airport Operations through Airport CDM

### Performance Improvement Area 1: Airport Operations

#### 3. ASBU B0-80/B0-ACDM: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>N</i>

#### 4. ASBU B0-80/B0-ACDM: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. Airport – CDM</i>	<i>December 2017 – NCAA, FAAN, NIMET, NCAA</i>
<i>2. Aerodrome certification</i>	<i>Lagos Certified 18<sup>th</sup> Sept 2017 – NCAA, FAAN</i>
<i>3. Airport planning</i>	<i>Implemented</i>
<i>4. Heliport operation</i>	<i>Implemented</i>
<i>5. SMS implementation</i>	<i>Implemented by NAMA, FAAN, and NIMET,</i>
<i>6. Regulations and technical guidance on RST</i>	<i>Regulations and Technical Guidance in 2015</i>





# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-25/B0-FICE

Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration

Performance Improvement Area 2: Global Interoperable Systems and Data Through Globally Interoperable System-Wide Information Management

### 3. ASBU B0-25/B0-FICE: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>

### 4. ASBU B0-25/FICE: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. Complete AMHS implementation</i>	<i>December 2017 for 11 airports – (NAMA)</i>
<i>2. AMHS interconnection (Gateway)</i>	<i>December 2017 Lagos and Kano – (NAMA)</i>
<i>3. Implement AIDC/OLDI at international airports</i>	<i>OLDI implemented in Lagos, Abuja, Kano and Port in 2010. AIDC in December 2017</i>
<i>4. Implement operational AIDC/OLDI between adjacent ACCs</i>	<i>December 2017 – NAMA</i>



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-105/B0-AMET

Meteorological Information Supporting Enhanced Operational Efficiency and Safety

Performance Improvement Area 2: Global Interoperable Systems and Data  
Through Globally Interoperable System-Wide Information Management

### *ASBU B0-10: Impact on Main Key Performance Areas (KPA)*

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>

### *4. ASBU B0-105/B0-AMET: Planning Targets and Implementation Progress*

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. WAFS and IAVW</i>	<i>Migrated to Secured SADIS FTP Internet File Service</i>
<i>2. Tropical cyclone watch (Volcanic Ash)</i>	<i>Implementing Volcanic Ash Alerting</i>
<i>3. Aerodrome warnings</i>	<i>Completed at all international airports - (NIMET)</i>
<i>4. Wind Share, OPMET, SIGMET, TAF, METAR</i>	<i>Implemented at all international airports</i>
<i>5. QMS</i>	<i>QMS Implemented and ISO 9001 Certification 2017</i>



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-30/B0-DATM Service Improvement through Digital Aeronautical Information Mgt

Performance Improvement Area 2: Global Interoperable Systems and Data  
Through Globally Interoperable System-Wide Information Mgt

### *ASBU B0-30/B0-DATM: Impact on Main Key Performance Areas (KPA)*

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>N</i>	<i>N</i>	<i>Y</i>	<i>Y</i>

### *3. ASBU B0-30/B0-DATM: Impact on Main Key Performance Areas (KPA)*

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. QMS for AIM</i>	<i>December 2017</i>
<i>2. e-TOD Implementation</i>	<i>December 2018</i>
<i>3. WGS-84 Implementation</i>	<i>Implemented 2012</i>
<i>4. AIXM, e-AIP, e-NOTAM, e-Flight Plan</i>	<i>December 2017</i>



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-10/B0-FRTO Improved Operations through Enhanced En-route Trajectories (Free Route Operations) Performance Improvement Area 3: Optimum Capacity and Flexible Flights Through Global Collaborative ATM

### 3. ASBU B0-10/B0-FRTO: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>N</i>

### 4. ASBU B0-10/B0-FRTO: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. Airspace planning</i>	<i>Implemented December 2015</i>
<i>2. Flexible use of airspace</i>	<i>Implemented December 2015</i>
<i>3. Flexible routing</i>	<i>Implemented December 2015</i>
<i>4. Free Routing – Enroute PBN</i>	<i>Implemented December 2020</i>



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-35/B0-NOPS

Improved Flow Performance through Planning based on a Network-Wide view  
(Air Traffic Flow Management)

Performance Improvement Area 3: Optimum Capacity and Flexible Flights  
– Through Global Collaborative ATM

### 3. ASBU B0-35/B0-NOPS: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>

### 4. ASBU B0-35/NOPS: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. Air Traffic Flow Management</i>	<i>December 2018</i>
<i>2.</i>	
<i>3.</i>	
<i>4.</i>	





# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-101/ACAS ACAS Improvements

Performance Improvement Area 3: Optimum Capacity and Flexible Flights  
Through Global Collaborative ATM

### 3. ASBU B0-101/ACAS: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>N</i>	<i>Y</i>	<i>N</i>	<i>Y</i>

### 4. ASBU B0-101/ACAS: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. ACAS II (TCAS Version 7.1)</i>	<i>Guidance Materials developed in 2015 on</i>
<i>2.</i>	<i>Development of Guidance Materials and</i>



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-84/ASUR

Improved Flow Performance through Initial capability for ground surveillance

Performance Improvement Area 3: Optimum Capacity and Flexible Flights  
Through Global Collaborative ATM

### 3. ASBU B0-84/ASUR: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>

### 4. ASBU B0-84/ASUR: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. Implementation of ADS-B</i>	<i>December 2018 – NCAA, NAMA and Airlines</i>
<i>2. Implementation of Multilateration</i>	<i>December 2018 – NCAA, NAMA and Airlines</i>
<i>3. Implementation of Ground Radar systems</i>	<i>Total Radar coverage of Nigerian airspace</i>
<i>3. Automation System (Presentation)</i>	<i>ATM Tower systems automated at Lagos,</i>



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-102/SNET Increased Effectiveness of Ground-based Safety Nets

Performance Improvement Area 3: Optimum Capacity and Flexible Flights  
Through Global Collaborative ATM

### 3. ASBU B0-102/SNET: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>N</i>	<i>N</i>	<i>N</i>	<i>Y</i>

### 4. ASBU B0-102/SNET: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. Short Term Conflict Alert (STCA)</i>	<i>Implemented in 2010</i>
<i>2. Area Proximity Warning (APW)</i>	<i>Implemented in 2010</i>
<i>3. Minimum Safe Altitude Warning (MSAW)</i>	<i>Implemented in 2010</i>
<i>4. Danger Area Infringement Warning (DAIW)</i>	<i>Implemented in 2010</i>
<i>5. Medium Term Conflict Detection (MTCD)</i>	<i>Implemented in 2010</i>



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-05/CDO

Improved Flexibility and Efficiency in Descent Profiles: Continuous Descent Operations (CDO)

Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations

### 3. ASBU B0-05/CDO: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>

### 4. ASBU B0-05/CDO: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. CDO implementation</i>	<i>Implemented CDO in Lagos, Abuja, Kano and Port Harcourt in 2012</i>
<i>2. PBN STARs implementation</i>	<i>Implemented PBN STARs in Lagos, Abuja, Kano and Port Harcourt in 2012</i>



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-20/CCO

Improved Flexibility and Efficiency in Departure Profiles: Continuous Climb Operations (CCO)

Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations

### 3. ASBU B0-20/CCO: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>

### 4. ASBU B0-20/CCO: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. CCO implementation</i>	<i>Implemented CCO in Lagos, Abuja, Kano and Port Harcourt in 2012</i>
<i>2. PBN SIDs implementation</i>	<i>Implemented PBN SIDs in Lagos, Abuja, Kano and Port Harcourt in 2012</i>





# ASBU Overview, CCO, CDO & Free Routing



## 2. REGIONAL /NATIONAL PERFORMANCE OBJECTIVE – B0-40/TBO

Improved Safety and Efficiency through the initial application of Data Link en-Route

Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations

### 3. ASBU B0-40/TBO: Impact on Main Key Performance Areas (KPA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>N</i>

### 4. ASBU B0-40/TBO: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. ADS-C over oceanic and remote areas</i>	<i>Implemented November 2015</i>
<i>2. Continental CPDLC</i>	<i>Implemented November 2015</i>
<i>3.</i>	
<i>4.</i>	



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-86/OPFL

Improved access to Optimum Flight Levels through Climb/Descent Procedures using ADS-B

Performance Improvement Area 3:

### 3. B0-86/OPFL: Improved KPA-Access/Equity to Optimum Flight Levels through Climb/Descent Procedures using ADS-B

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>

### 4. ASBU B0-86/OPFL: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. ITP Using ADS-B</i>	<i>The use of ADS-B for Climb and Descent Procedures to increase efficiency on oceanic and potentially continental en-route is currently not required within the Kano FIR as Radar and ADS-C is currently fully implemented over the entire airspace.</i>
<i>2.</i>	



# ASBU Overview, CCO, CDO & Free Routing



## 2. NATIONAL PERFORMANCE OBJECTIVE – B0-85/ASEP

Performance Improvement Area 3:  
Optimum Capacity and Flexible Flights – Through Global Collaborative ATM

### 3. B0-85/ASEP: Air Traffic Situational Awareness (ATSA)

	<i>Access &amp; Equity</i>	<i>Capacity</i>	<i>Efficiency</i>	<i>Environment</i>	<i>Safety</i>
<i>Applicable</i>	<i>N</i>	<i>N</i>	<i>Y</i>	<i>N</i>	<i>Y</i>

### 4. ASBU B0-85/ASEP: Planning Targets and Implementation Progress

<i>Elements</i>	<i>Implementation Status (Ground and Air)</i>
<i>1. ATSA - AIRB</i>	<i>Most operators already equipped with ADS-B</i>
<i>2. ATSA - VSA</i>	<i>December 2018 for implementation</i>
<i>3.</i>	<i>NCAA to develop guidance materials for</i>
<i>4.</i>	



## IMPLEMENTATION OF FREE ROUTING AIRSPACE



# ASBU Overview, CCO, CDO & Free Routing



## Free Routing Airspace Operations

### Free Routing Airspace:







### APIRG/22: Free Route Airspace

- Implementation of Free Route Airspace (FRA) in AFI Region should be incremental and the approach should involve:
- a) The identification of States/ANSPs that have the capacity to implement free routing based on ATM systems infrastructure and capability e.g. communication and surveillance (VHF coverage, ADS-B, ADS-C/CPDLC, Radar), requisite separation standards, air traffic controller conflict detection tools, controller training and capacity enhancement.



## APIRG/22: Free Route Airspace

- Develop the concept of operations and an implementation plan which shall include; definition of the applicable 'specific airspace', the airspace design, time of operationalization (e.g. night, weekend), applicable flight level blocks (e.g. above FL360 only), procedures and requirements for flight planning, procedures for transitioning from free route to fixed route and vice a versa and entry/exit points (for complex airspace) defined by Latitude/Longitude, etc.
- Implementation of FRA should be preceded by a safety case and a definite trial period before full implementation.





## APIRG/22: Free Route Airspace

### APIRG/22 Conclusion 22/37: Free Routing Airspace

That, in order to foster the concept of free routing in the AFI continental airspace in preparation for the ASBU B1 module,

- a) States consider incorporating Free Route Airspace concept into their national airspace concept and ATM Master Plan in line with the B1-FRTO ASBU module and AAO Sub-Group project plans; and
- b) East African States including, Seychelles, Mauritius, Kenya, Ethiopia, Tanzania and Uganda develop and implement Free Route Airspace as a case study for implementation of Free Routing Airspace in AFI Region as part of B1-FRTO ASBU module.



# ASBU Overview, CCO, CDO & Free Routing



## Free Routing Concept Overview

### ➤ FRA Concept Overview:

➤ FRA is defined as “A specified airspace within which users may freely plan a route between a defined entry point and a defined exit point, with the possibility to route via intermediate (published or unpublished) waypoints, without reference to the ATS route network, subject to airspace availability.” Within this airspace, flights remain subject to air traffic control.



## Free Routing Concept Overview

### ➤ FRA Concept Overview

- Within FRA air traffic will be able to flight plan user preferred trajectories without reference to a route structure, therefore flows of traffic are able to change hour by hour, month by month and year by year in a manner which is not constrained by airspace design and is therefore less predictable.



# ASBU Overview, CCO, CDO & Free Routing



## Free Routing Concept Overview

### ➤ Factors that can affect Free routings operations:

- • weather/winds (jet stream position),
- • ATM Contingencies, ATFM,
- • Volcanic Ash,
- • military activities,
- • ATC traffic regulations (used to manage flows).





# ASBU Overview, CCO, CDO & Free Routing



## Free Routing Concept Options

- **FRA can be implemented through any of the following:**
- **FRA Option 1.** In which all ATS routes are removed.
- **FRA Option 2.** In which the ATS route structure is partially maintained.
- **FRA Option 3.** In which the ATS route structure is maintained, but aircraft are not constrained to flight plan the routes within the FRA.



## Free Routing Concept Options

### ➤ FRA Option 1:

- Option 1 represents where all routes are removed. By removing the route structure, it encourages more efficient flight planning behaviour, thus increasing the likelihood of benefit realisation. It creates a consistent environment for air traffic controllers, whereby all conflicting points are determined by aircraft trajectory.



# ASBU Overview, CCO, CDO & Free Routing



## Free Routing Concept Options

### ➤ FRA Option 2:

- Option 2 represents a compromised implementation of FRA where some routes are retained primarily to manage flows and transitions into and out of FRA. For example, rather than using mandated waypoints for aircraft leaving FRA inbound to an airport, routes would be extended into FRA to connect to STARs or lower Route Structures .



# ASBU Overview, CCO, CDO & Free Routing



## Free Routing Concept Options

### ➤ FRA Option 3:

- Option 3 represents a compromise implementation of FRA where all ATS routes are retained, but aircraft operators are not required to flight plan along the routes. This represents a significant compromise to the implementation of FRA.
- Option 3 has the potential to minimize the initial impact on airline operators. By retaining all upper routes, airlines and flight planning service providers could decide when to embrace FRA and either route direct, or continue to flight plan and fly the existing ATS route structure. This option could be used as a transitional arrangement to minimize the initial impact on airline operations, with routes being withdrawn at a later date . However, this will create additional workload for ATC.



# ASBU Overview, CCO, CDO & Free Routing



## Free Routing - Benefits

### ➤ FRA Systemisation and separation

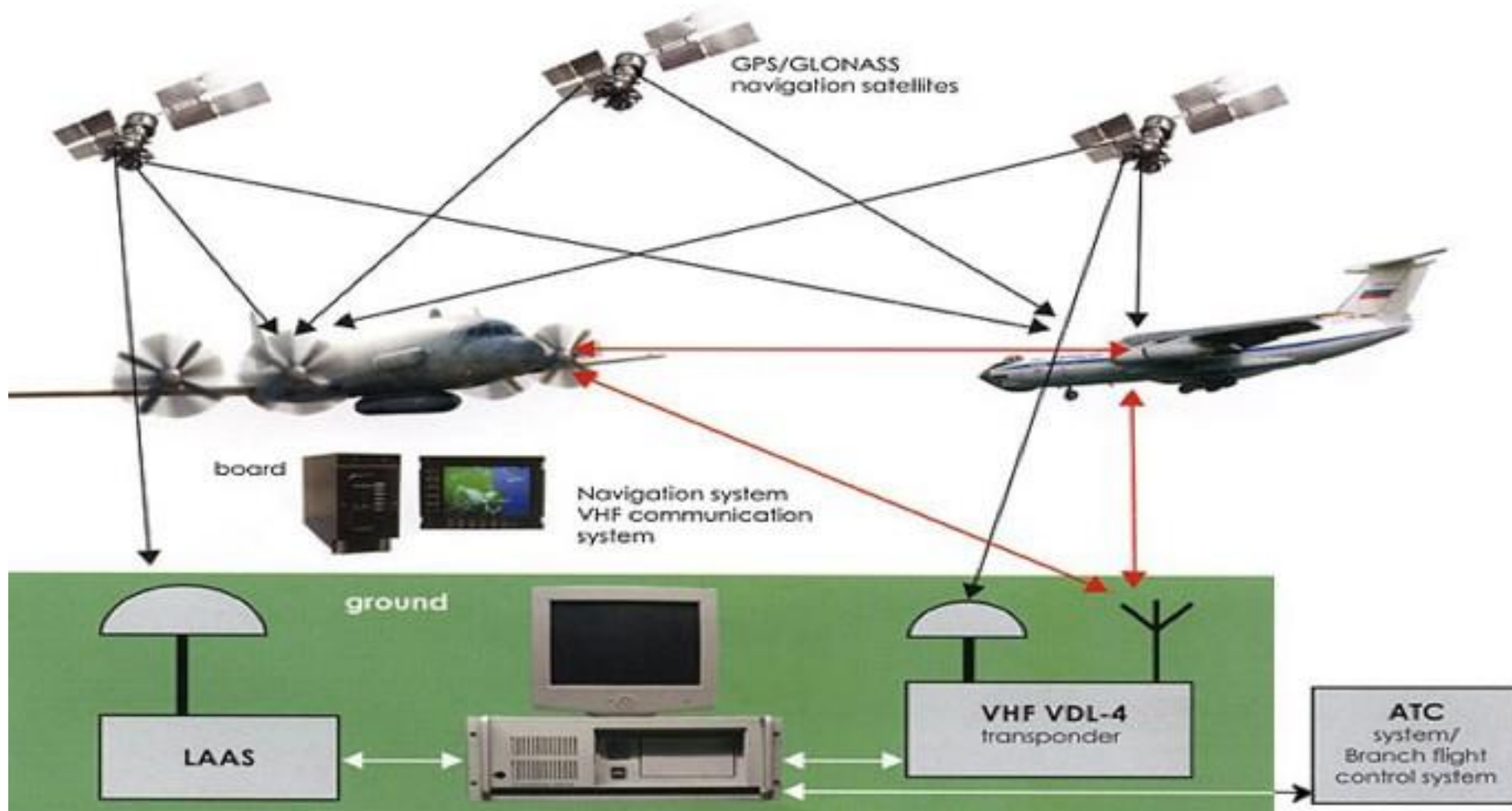
- Flights within the FRA will be monitored on Radar by ATC with the assistance of other automated track-keeping systems and conflict detection tools. These will alert ATC if a flight deviates from its expected trajectory, or if aircraft trajectories are in conflict and hence ATC intervention is required.
- Optimisation of traffic flows will be achieved in areas of high traffic density and complexity through the use of standard operating procedures which will require that flight plans pass through designated waypoints depending on origin or destination e.g. requirements for entering or exiting designated FRA Airspace.



# ASBU Overview, CCO, CDO & Free Routing



## Required Communication Systems for FRA







# ASBU Overview, CCO, CDO & Free Routing



Required Surveillance Systems for FRA

## Space Based ADS-B





# ASBU Overview, CCO, CDO & Free Routing



## Free Routing - Benefits

### ➤ FRA Benefits

- FRA is also expected to facilitate flight planning and fuel benefits which will contribute to airline efficiency.
- FRA implementation will reduce pilot and ATC workloads.
- FRA will lead to reduction in CO2 missions.
- Enhanced ATM Capacity.
- Enhanced safety and efficiency by use of advanced avionics systems.



# ASBU Overview, CCO, CDO & Free Routing



## Benefits of Free Routing Airspace

### Free Routing Airspace:





# ASBU Overview, CCO, CDO & Free Routing



## Free Routing - Challenges

### ➤ FRA Challenges

- FRA implementation could be affected by severe weather leading to significant deviation from desired flight trajectories.
- FRA implementation could be suspended in the event of ground surveillance system failure.
- Lack of appropriate safety assessment could jeopardise FRA.
- FRA could also be affected by ATM contingencies.



## Free Routing - Challenges

### ➤ FRA Challenges

- Definition of the type of airspace or class of airspace.
- Determination of applicable separation standard in FRA.
- Determination of vertical and lateral limits of the FRA.
- Lack of predictability of flight paths in FRA by ATC.





# ASBU Overview, CCO, CDO & Free Routing



## Challenges of Free Routing Airspace

### Free Routing Airspace Challenges:







# ASBU Overview, CCO, CDO & Free Routing



## Conclusion

- The implementation new concepts such as Aviation Systems Block Upgrade, Continuous Climb Operations, Continuous Descent Operations and Free Routing Airspace will definitely come with cost and challenges.
- However, the expected benefits of the implementation to safety, efficiency, capacity, environment, cost effectiveness, etc, will most certainly outweigh the cost.
- It is necessary to note that the implementation of these concepts will not be accomplished without the required training of the stakeholders.



## Conclusion

**Thank You Very Much**

**Pwajok Matthew Lawrence**

**Director of Operations**

**Nigerian Airspace Management Agency**

**Email: [mpwajok@nama.gov.ng](mailto:mpwajok@nama.gov.ng)**

**Mobile: +2348050786333**



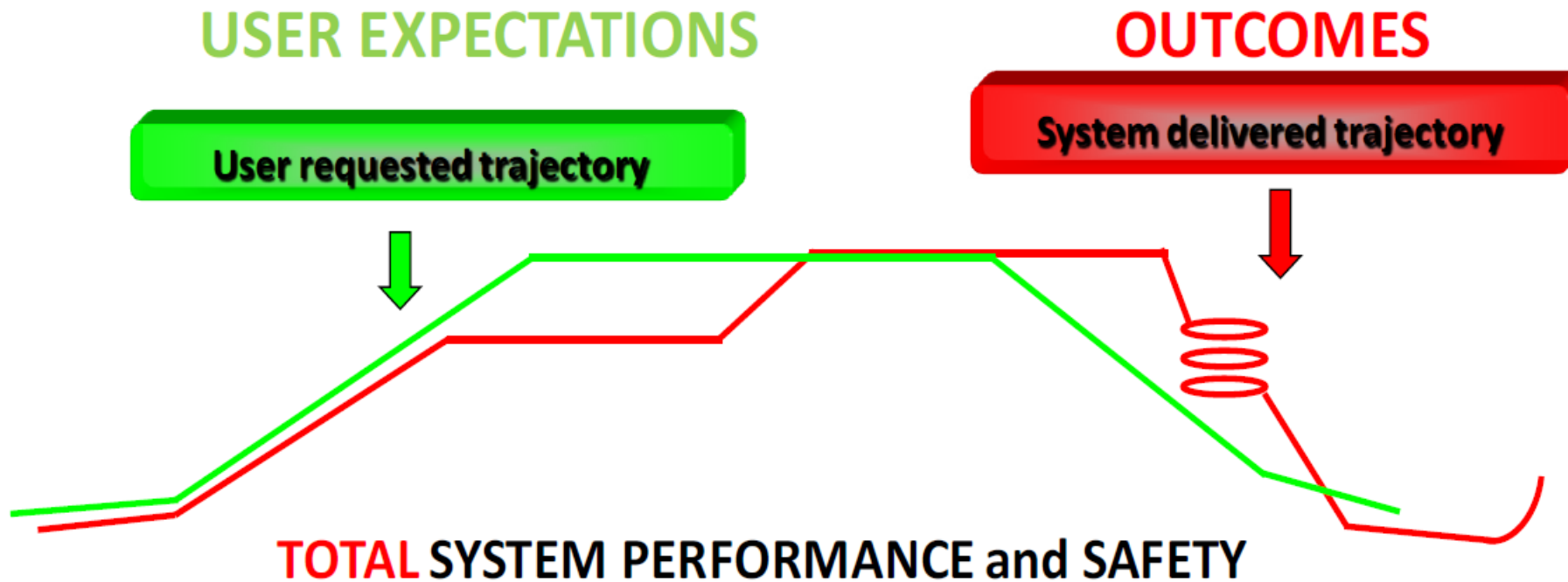
# **Mr. Colin Bryant**

## **ATM OPS System Specialist**

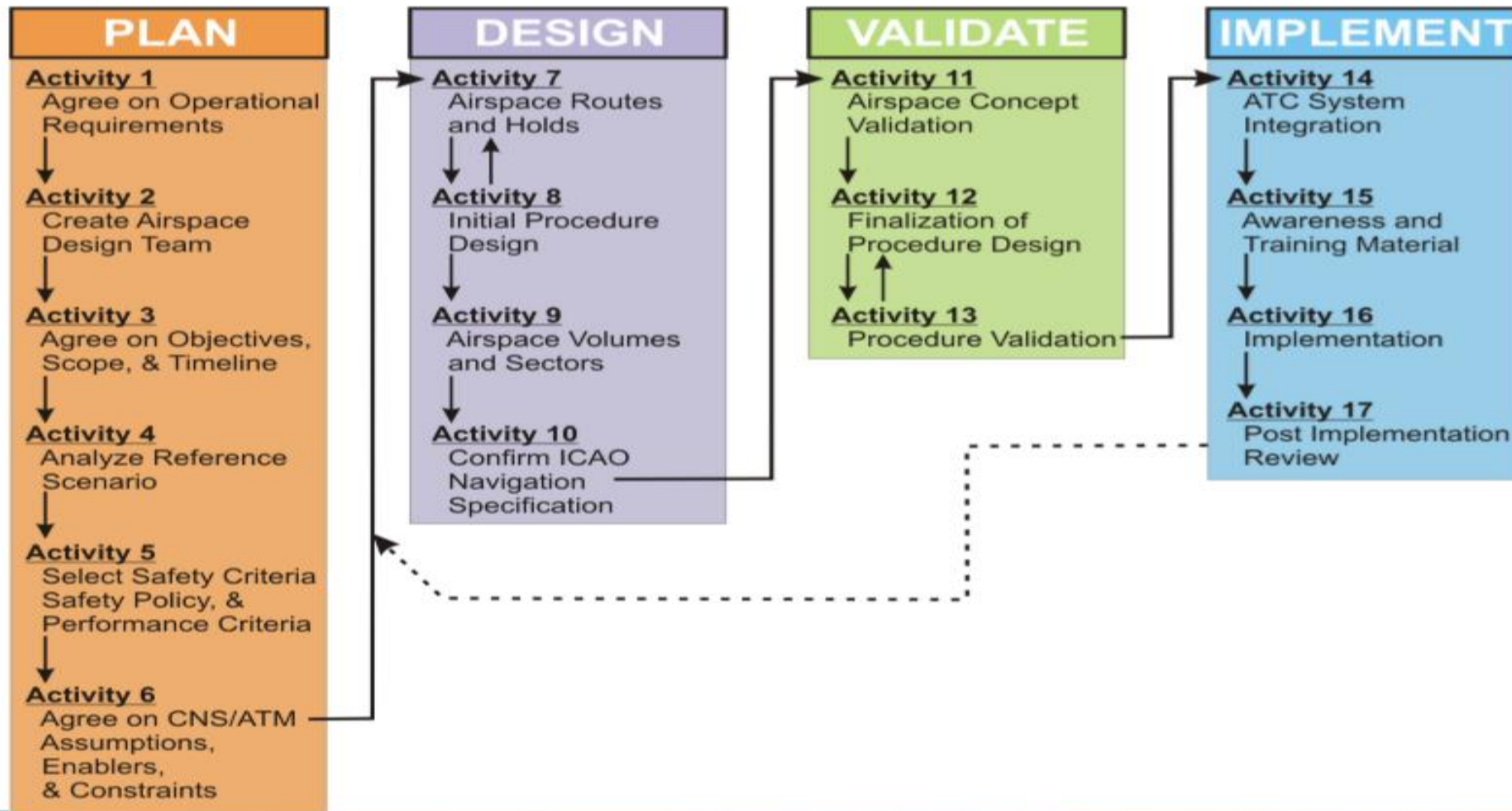
**ATNS**

# REVIEW

Given that the effort of managing airspace is a product of a system and collective action, the entire ATM Community is involved

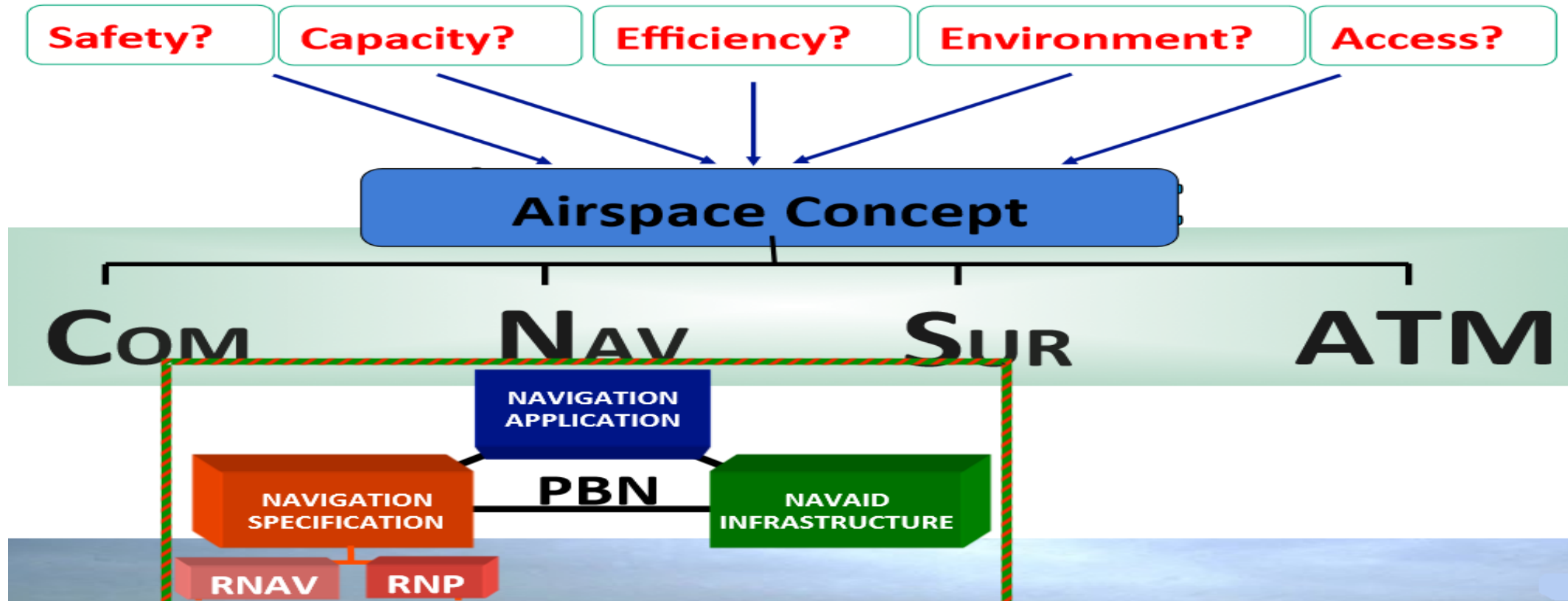


# REVIEW



# REVIEW

## Strategic Goals & Implementation Process





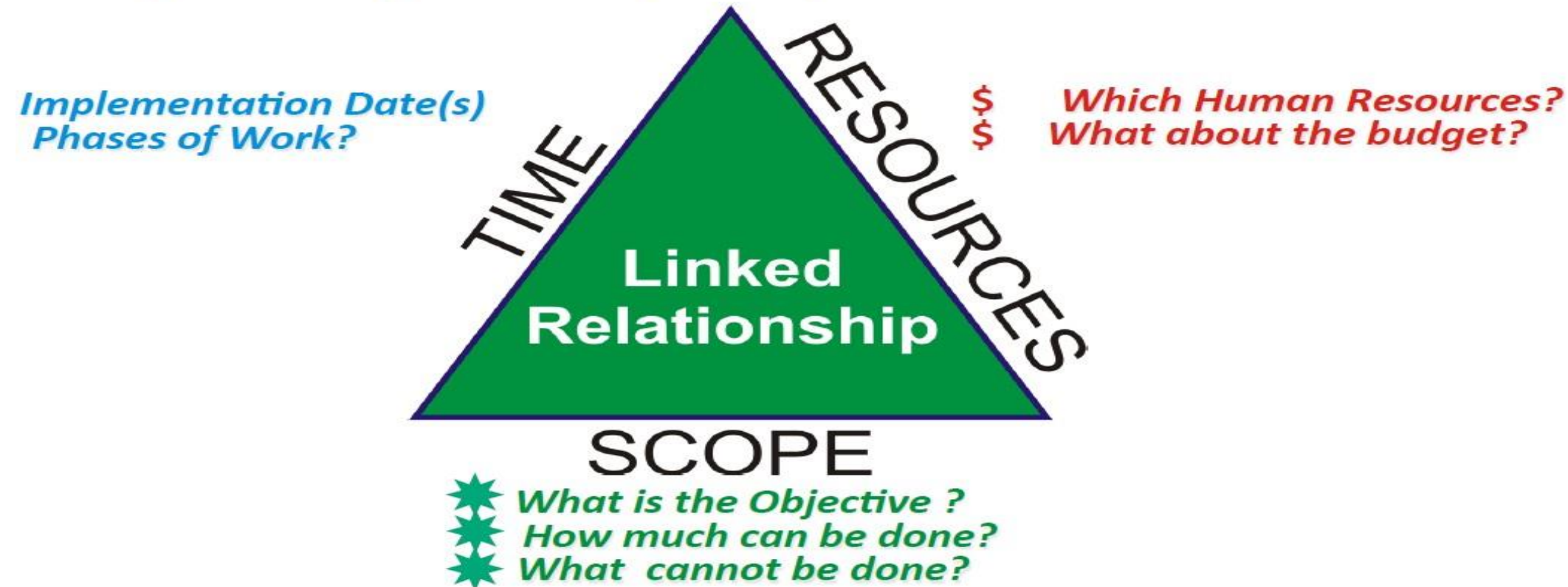
# REVIEW



# REVIEW

PLAN

## Project objectives, scope and timescales



**Beware of Project Creep!**

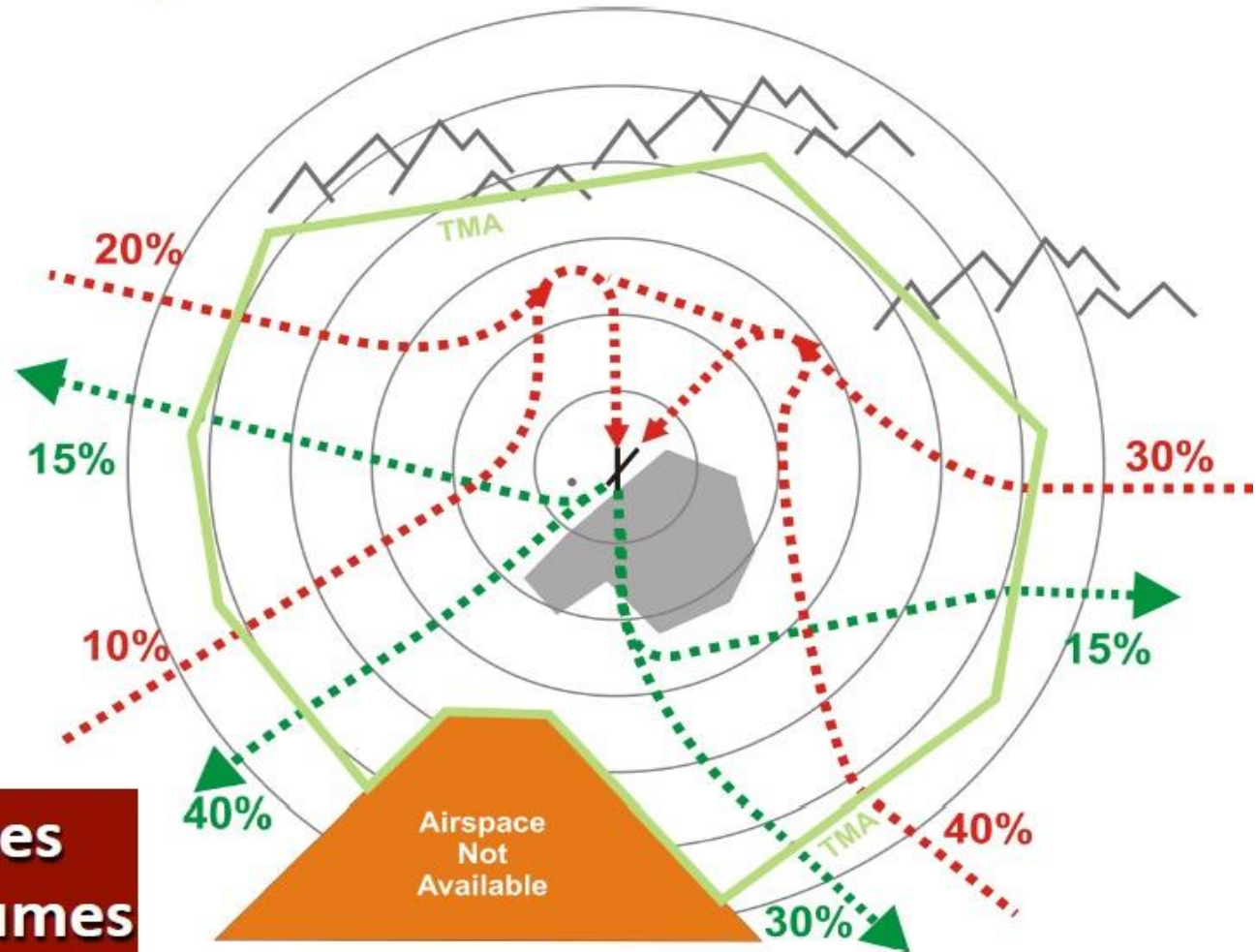
# REVIEW

## 7 – Design the Airspace

DESIGN

- ✈ Arrivals
- ✈ Departures
- ✈ Transit
- ✈ VFR
- ✈ Military

**AVOID trying to fit the routes into the existing airspace volumes**





# REVIEW

IMPLEMENT

✈️ **Post Implementation Review**

✈️ **Keep LOG**

✈️ **Assess if objectives are met**

✈️ **Measure!**

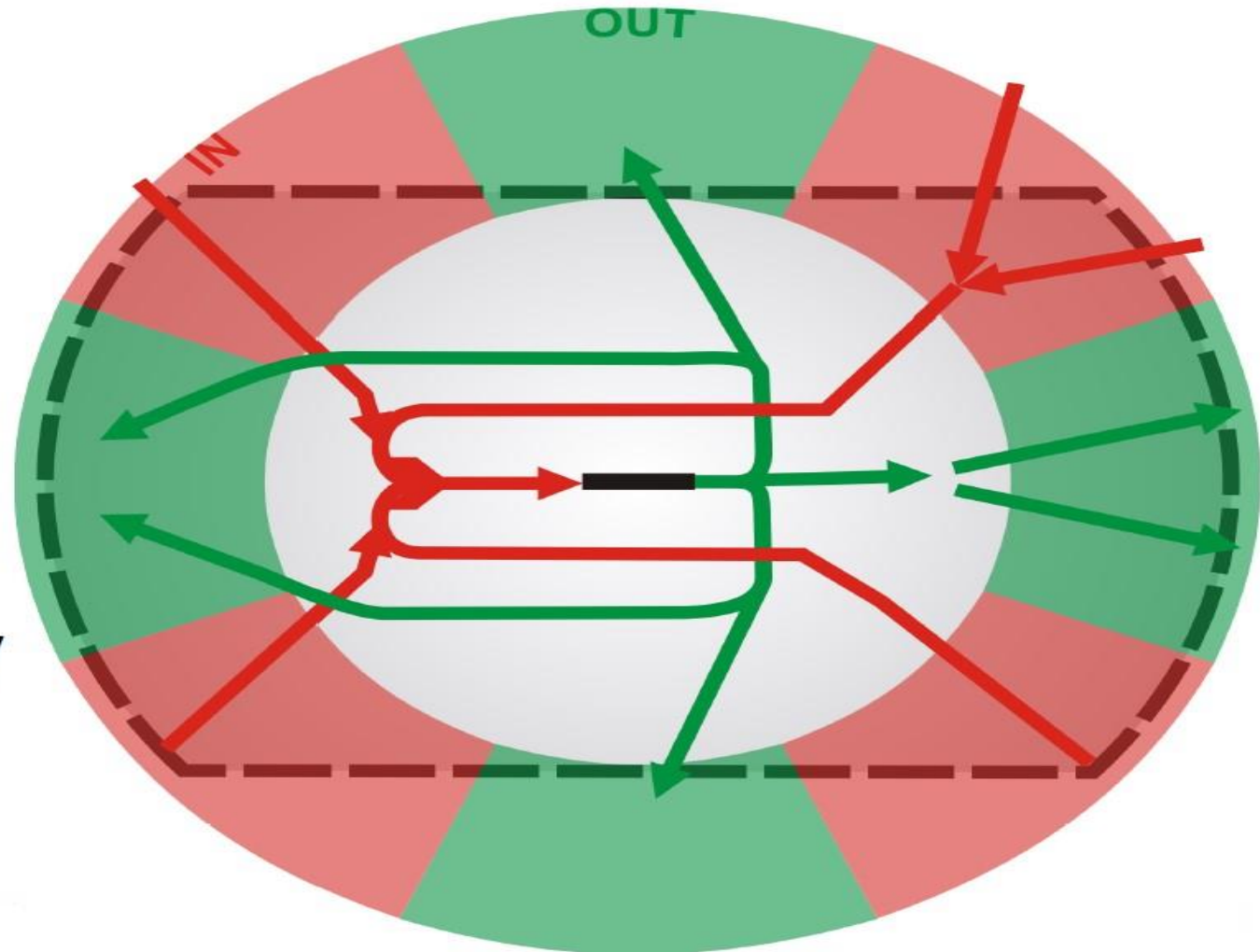
✈️ **System safety assessment – collect evidence**

# REVIEW

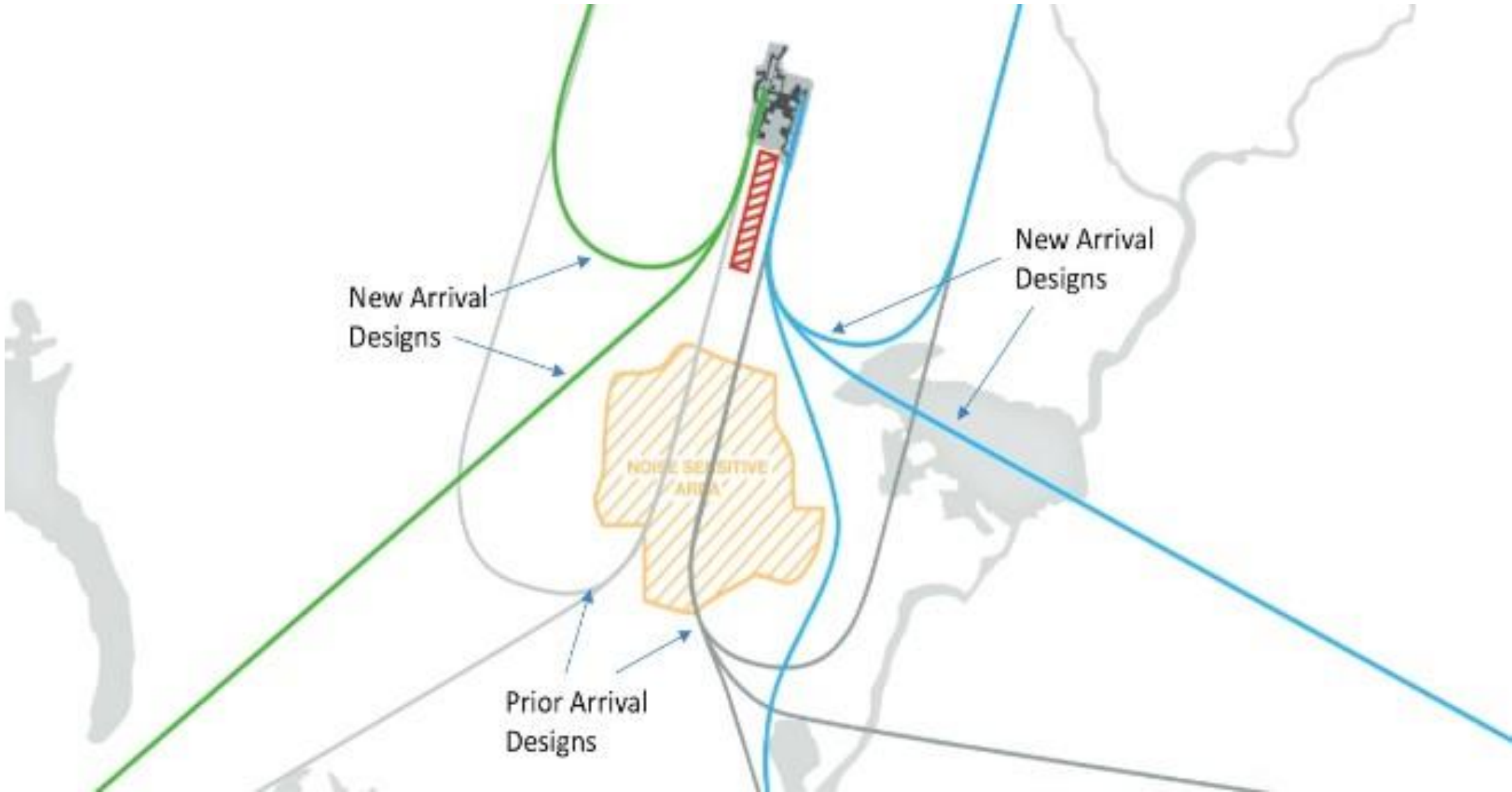
## Good Design Practice

Generic  
CORNER-POST  
example:

Flows by quadrant,  
segregate **Arrivals**  
laterally and vertically  
from **Departures**



# REVIEW

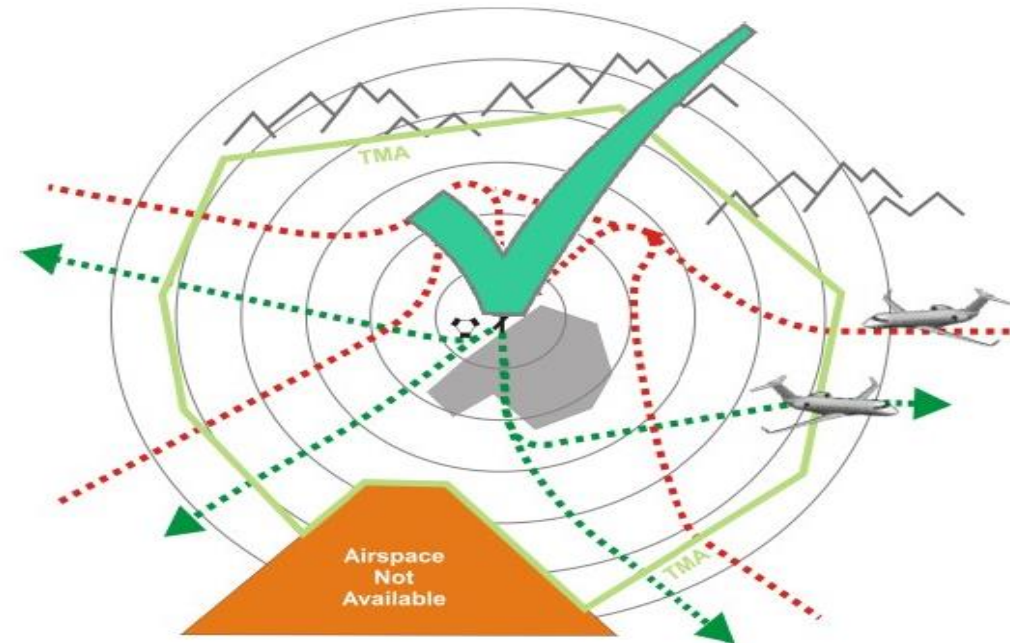
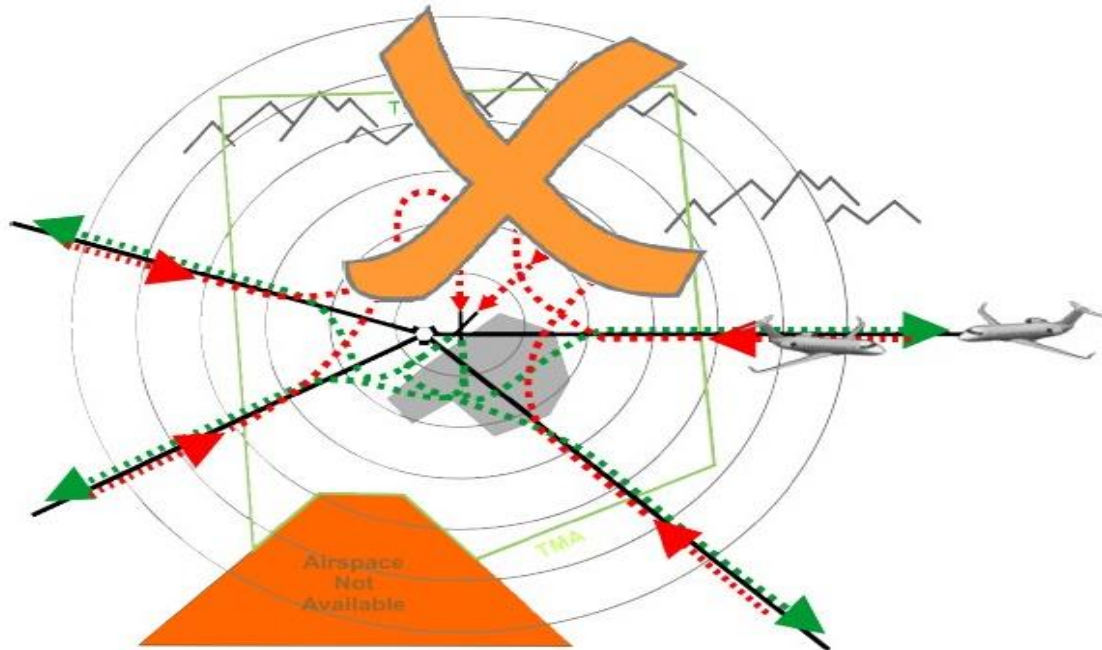




# REVIEW

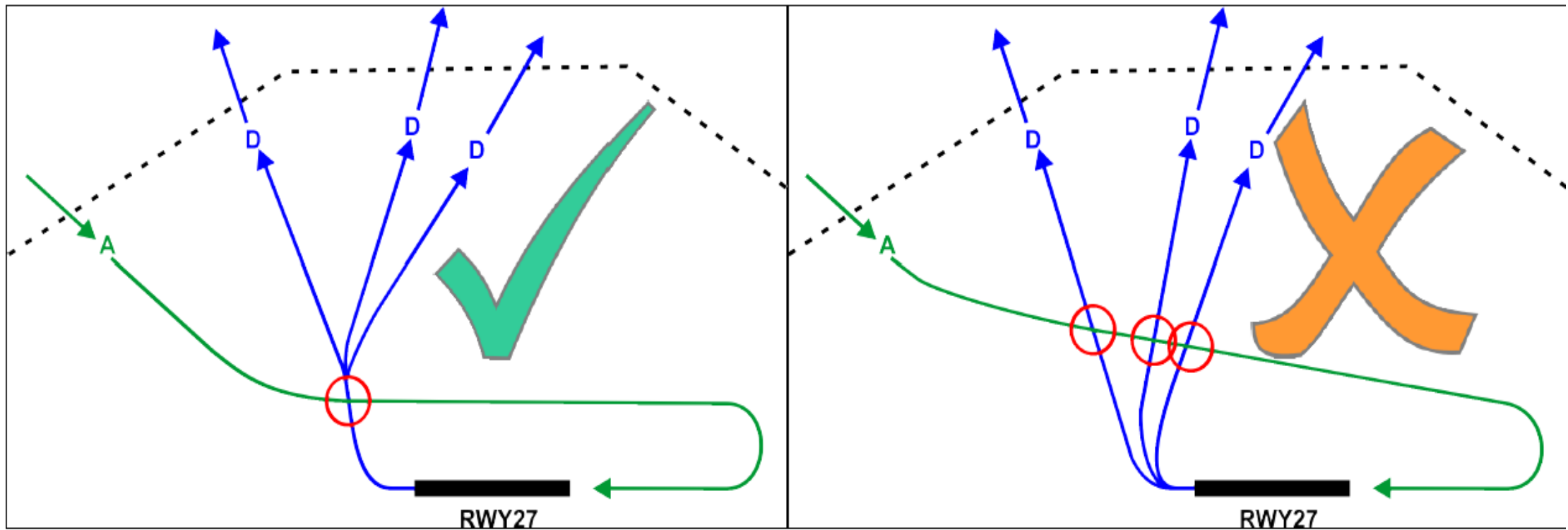
## Good Design Practice

- ✈ Segregate routes for entry and exit points



# PBN Principles

✈ Minimize Crossing Complexity



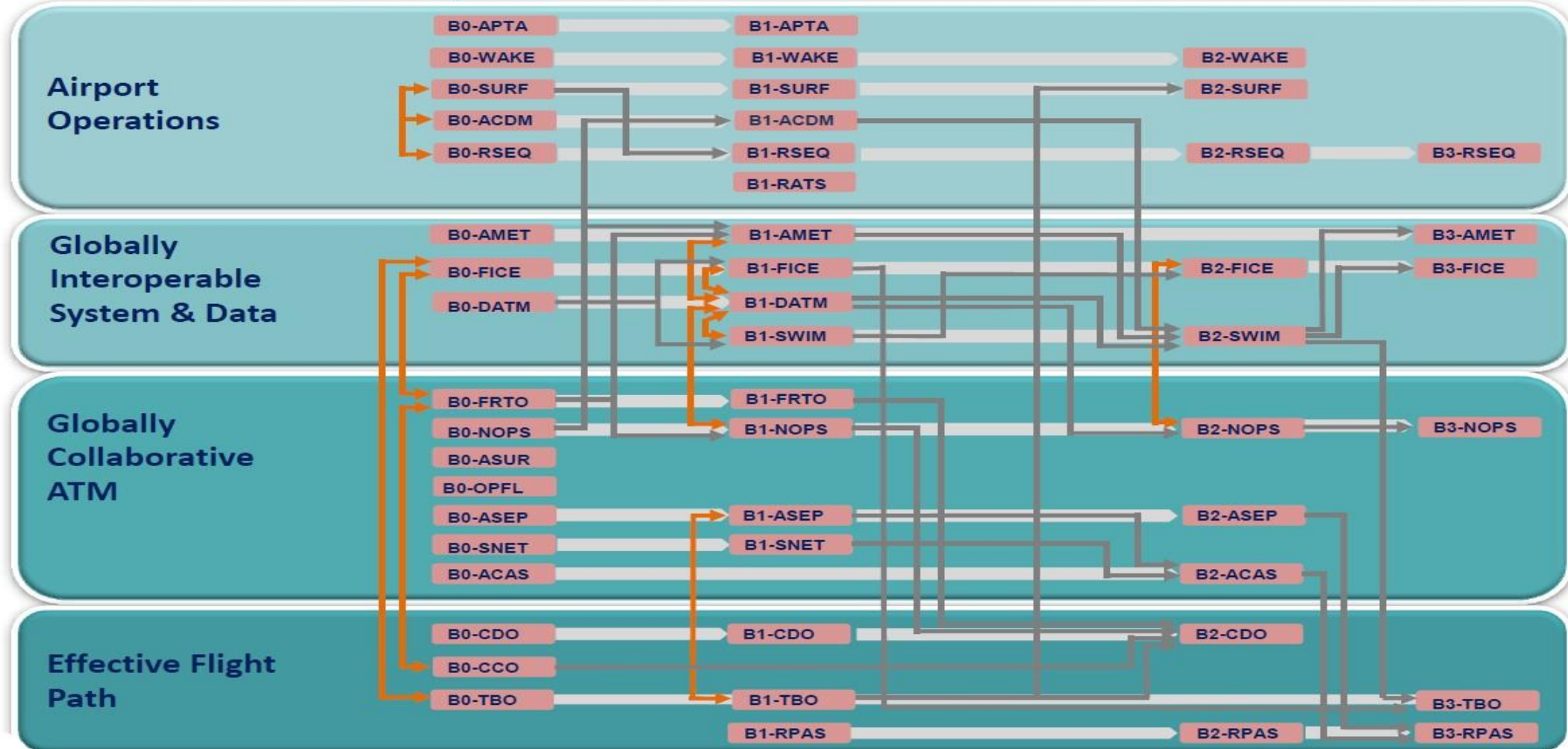
# REVIEW

## FRTO

- **Improved operations through enhanced en-route trajectories.**
- Allow the use of airspace which would otherwise be segregated (i.e. special use airspace)

# REVIEW

## Module Dependencies



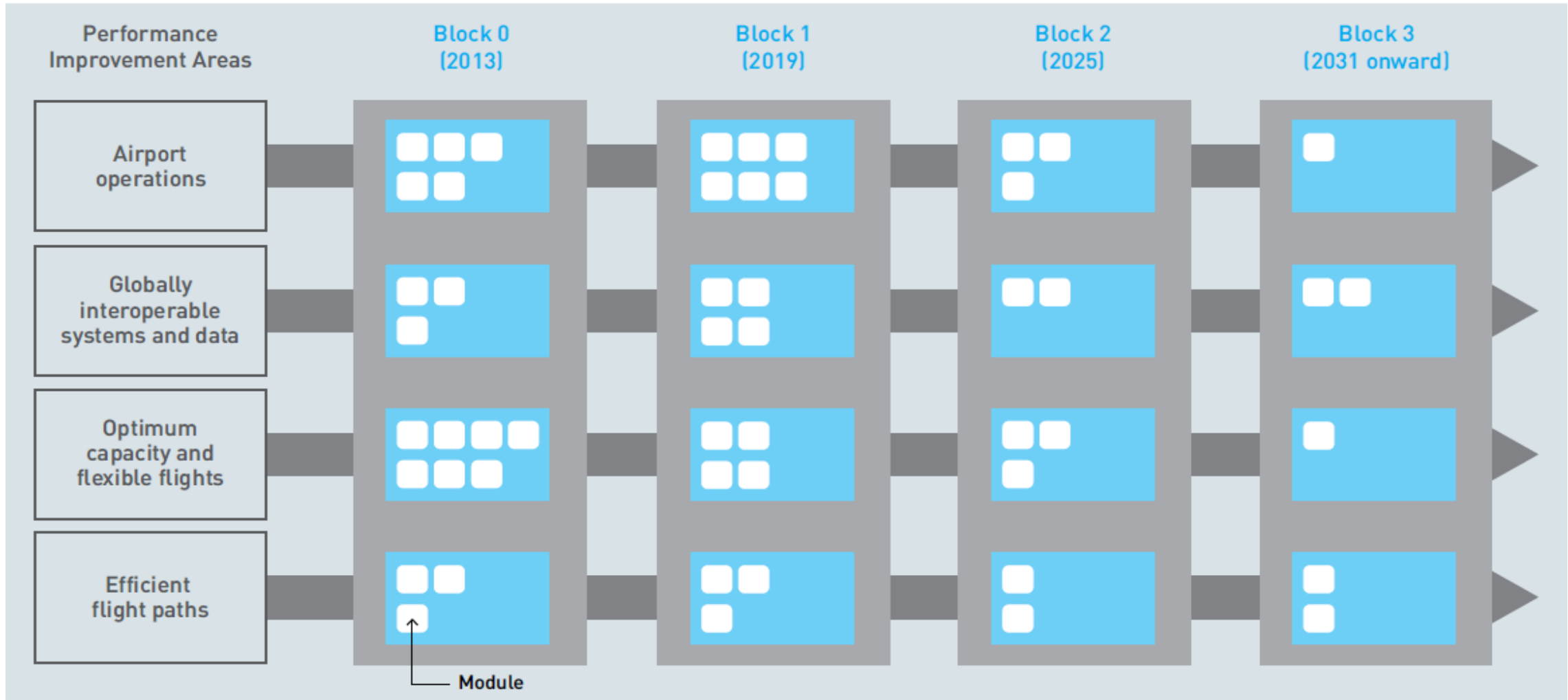
# ASBU Overview

## 4 Main Performance improvement areas

- Airport Operations (5 modules)
- Globally interoperable systems & data (3 modules)
- Optimum capacity & flexible flights (7 modules)
- Efficient flight path (3 modules)

- Block 0 will serve as the enabler and foundation for the envisioned future aviation systems.

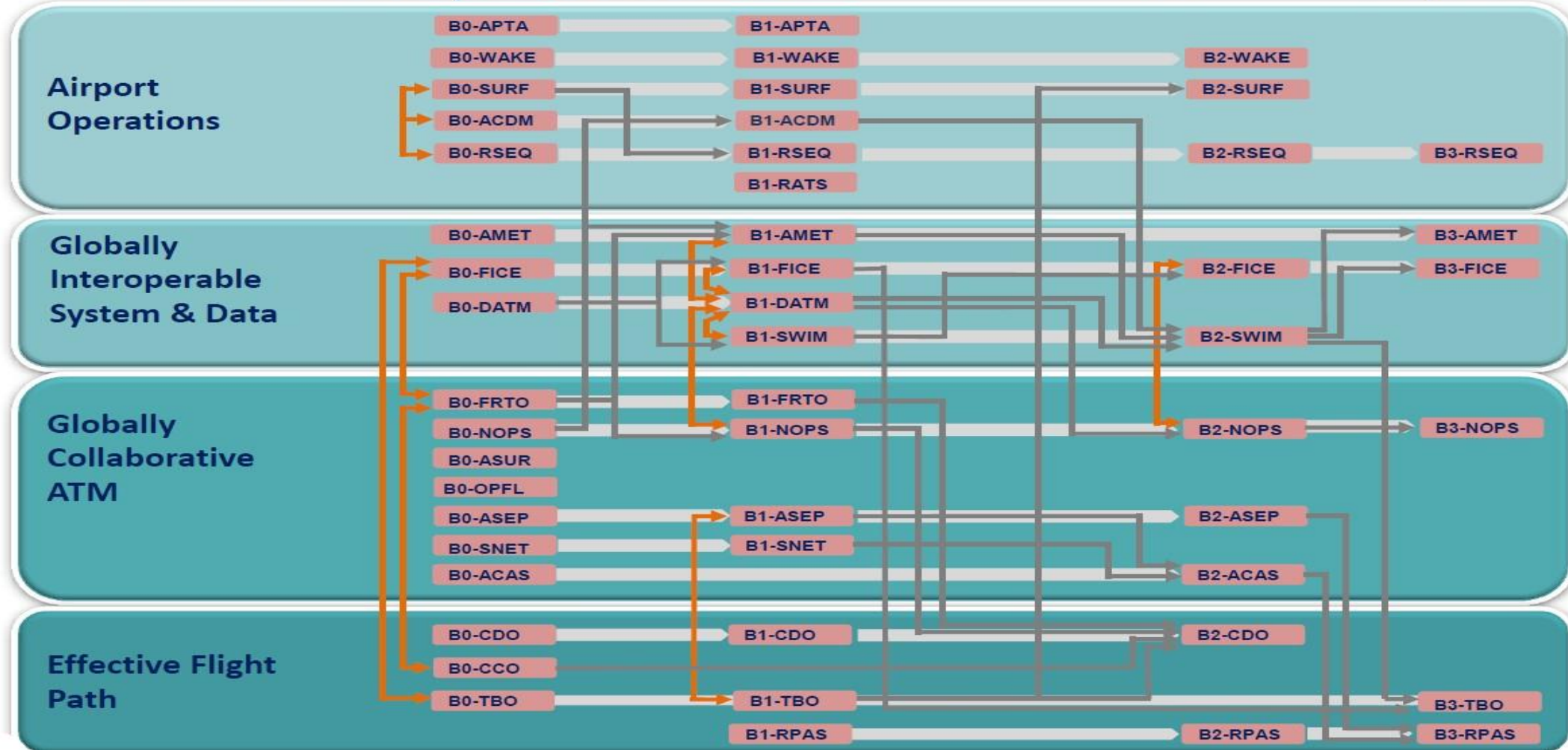
# ASBU Overview





# ASBU Overview

## Module Dependencies



# Free routing

## Definition:

- **Free Route Airspace (FRA)** - Specified airspace - users may freely plan a route between an entry point and an exit point.
- **Subject to airspace availability**, the route can be planned directly from one to the other or via intermediate (published or unpublished) waypoints, without reference to the existing ATS route network.

# Free routing

Within this airspace, flights remain subject to air traffic control.



# Free routing

## Free route airspace (FRA)

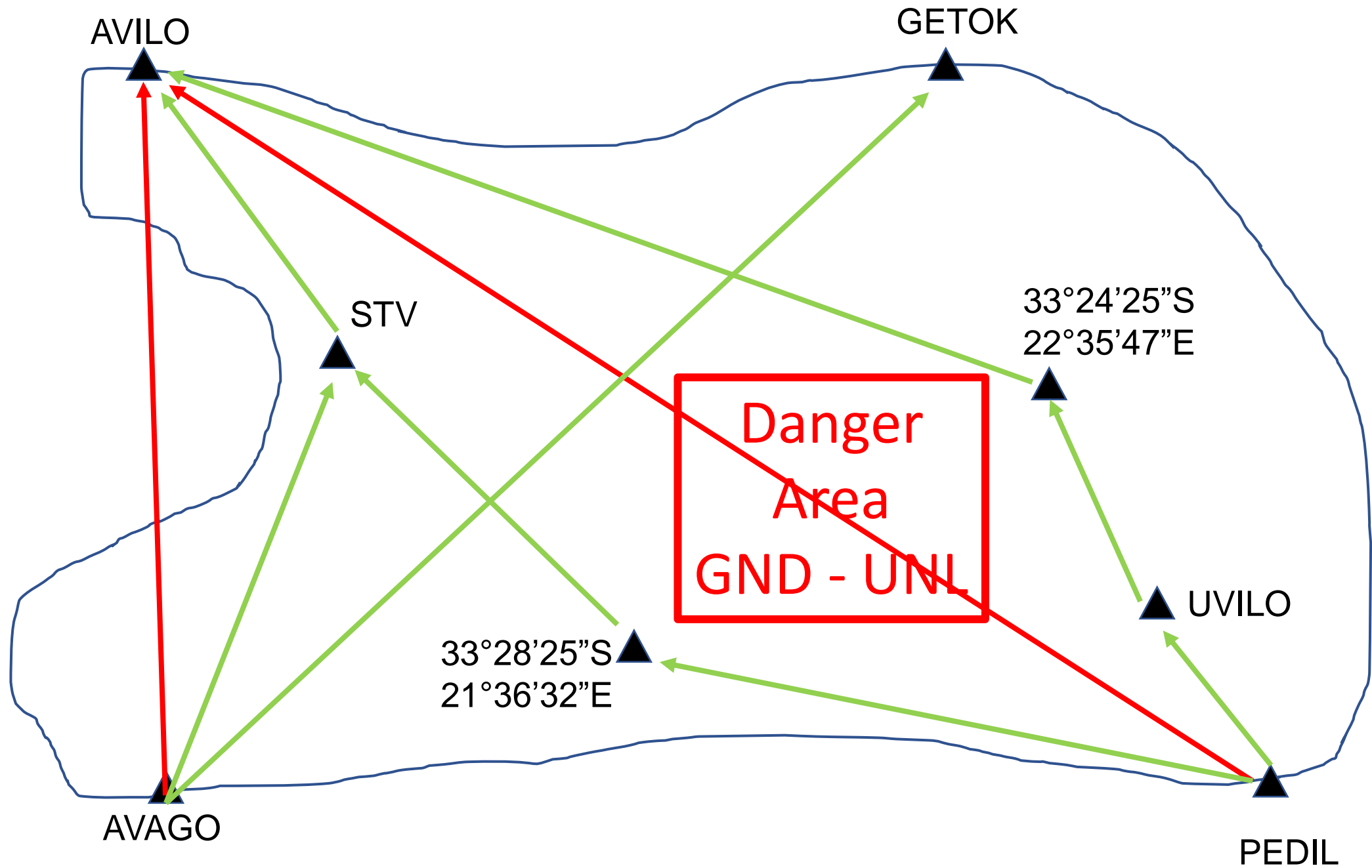
- a. A concept of providing air traffic services
- b. Operator can choose their route subject to only a few limitations (E.g. **fixed entry** and **exit points** and the need to avoid **Danger areas**, **TRAs** or **TSAs**) as opposed to the situation where standard airways should be used.

# Free routing

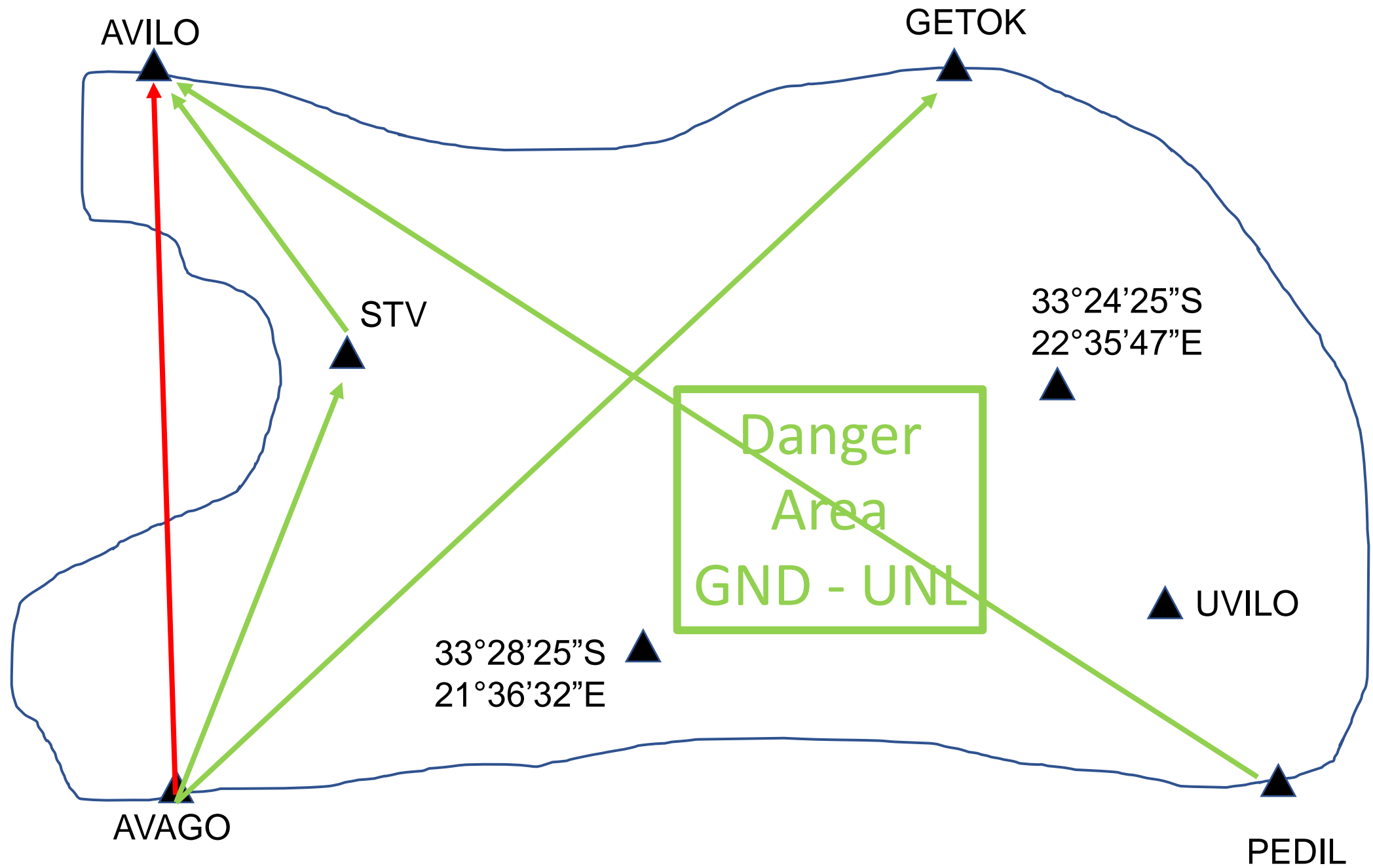
- In most cases - straight line between an entry point and exit point chosen.
- If this is not appropriate (e.g. a danger area needs to be avoided) additional turning points can be specified, eg:

**navigation aids, published navigational points or points with specified coordinates.**

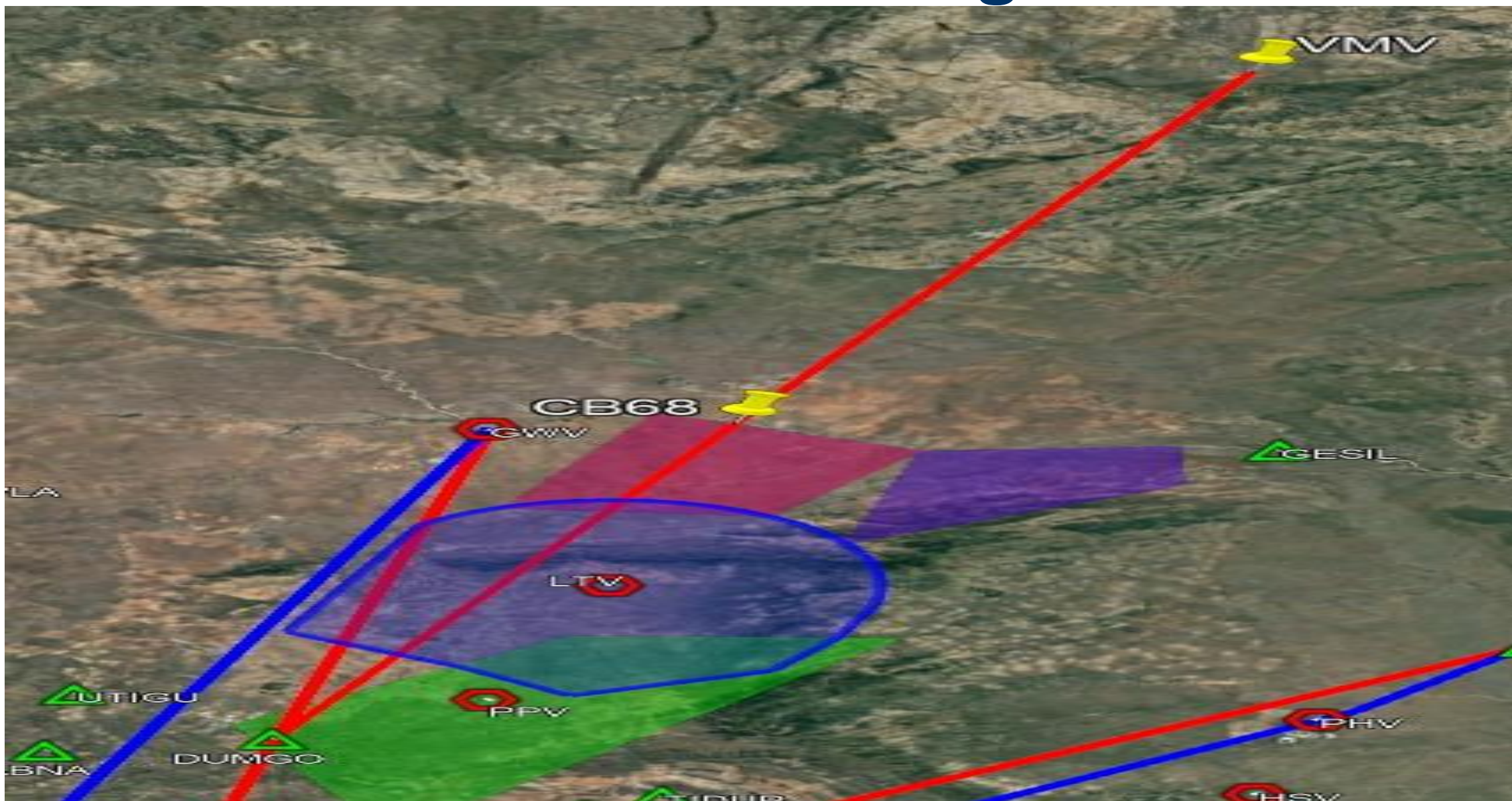






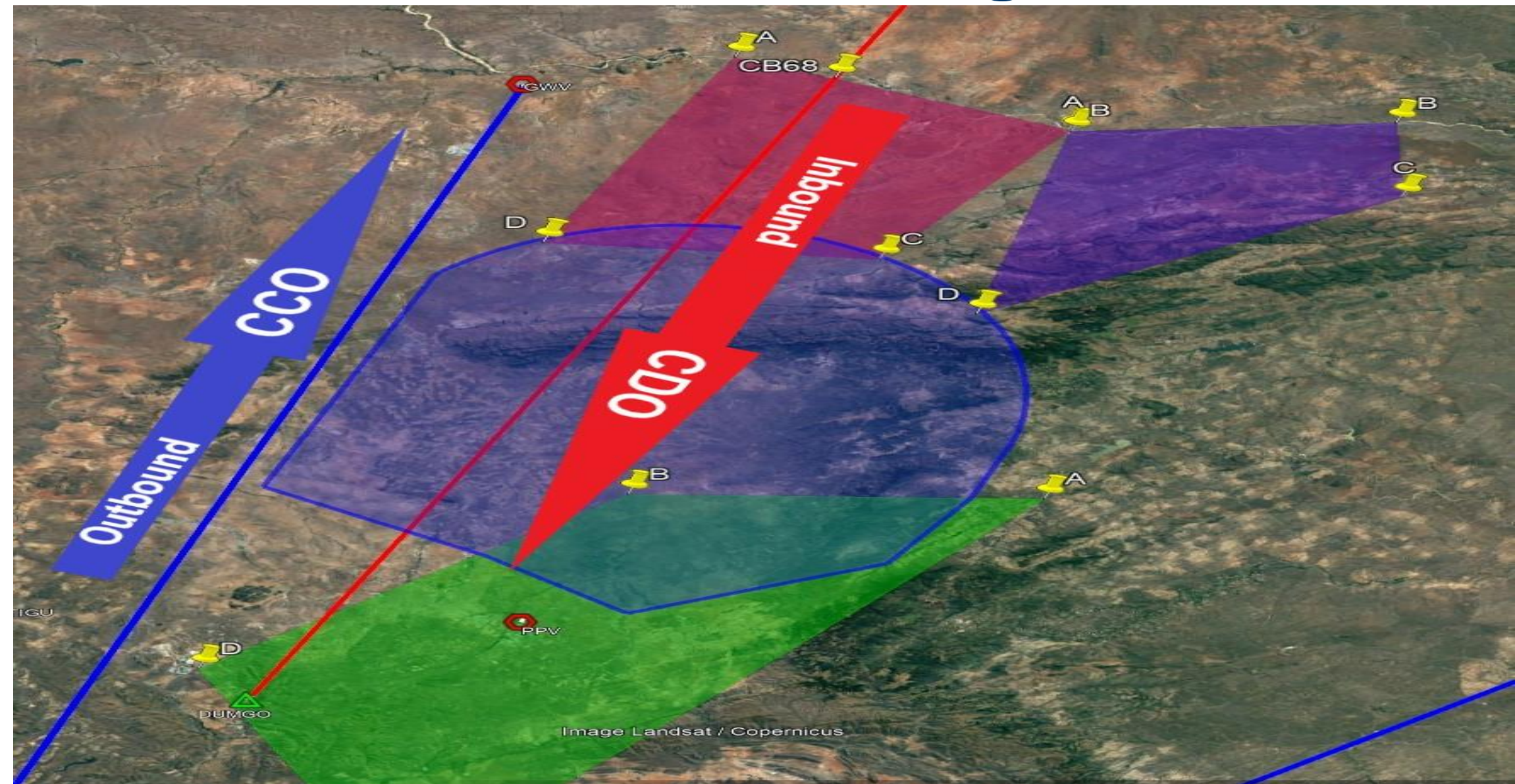


# Free Routing





# Free Routing



# FRT0


- **Implications:**
- VMV to CB68 (New FIR 5LNC) is **18NM** (Nautical miles) shorter than the current VMV – GWV routing.
- $18\text{nm} \times 7 \text{ flights per week} = 126 \text{ NM saving}$
- 504 NM saving per month
- 6048 NM per year
- Seems small – Effect is large

# FRT0

## Example:


- UAE – Over half airspace is military.
- Opening this airspace could potentially give:
  - = Yearly savings of approximately 4.9 million litres of fuel.
  - = Yearly savings of 581 flight hours

# FRTO

- Applicable – en-route and terminal airspace.
  - Larger the airspace = larger the benefit.
  - Better/Some access to permanent segregated A/S.
  - Reducing congestion
  - Better flight trajectories – Optimum routing.
  - Efficiency = Environment friendly
  - Flexibility and predictability
- 




# FRTO

- **COVID 19**
  - Decimated traffic numbers
  - Post COVID – Need sustainable ways to assist airlines with economic recovery.
  - FRTO – Easy to implement, requires CDM
  - Less track miles = greater savings = efficiency = Environmental benefit
- 

# Poll question

**On a single flight plan, is an A/C allowed to exist and re-enter one particular FRA?**

- a) Yes
  - b) Sometimes
  - c) No
  - d) Not sure
- 

# Free routing

## Can be:

- Time limited (E.g. at night) – Transitional step
- Structurally/Geographically limited  
(Restricted entry/exit points)



Could have a negative impact on capacity in busy airspace

# Free routing

**Can be:**

- Implemented in a FAB

Functional Airspace Block



Advanced implementation



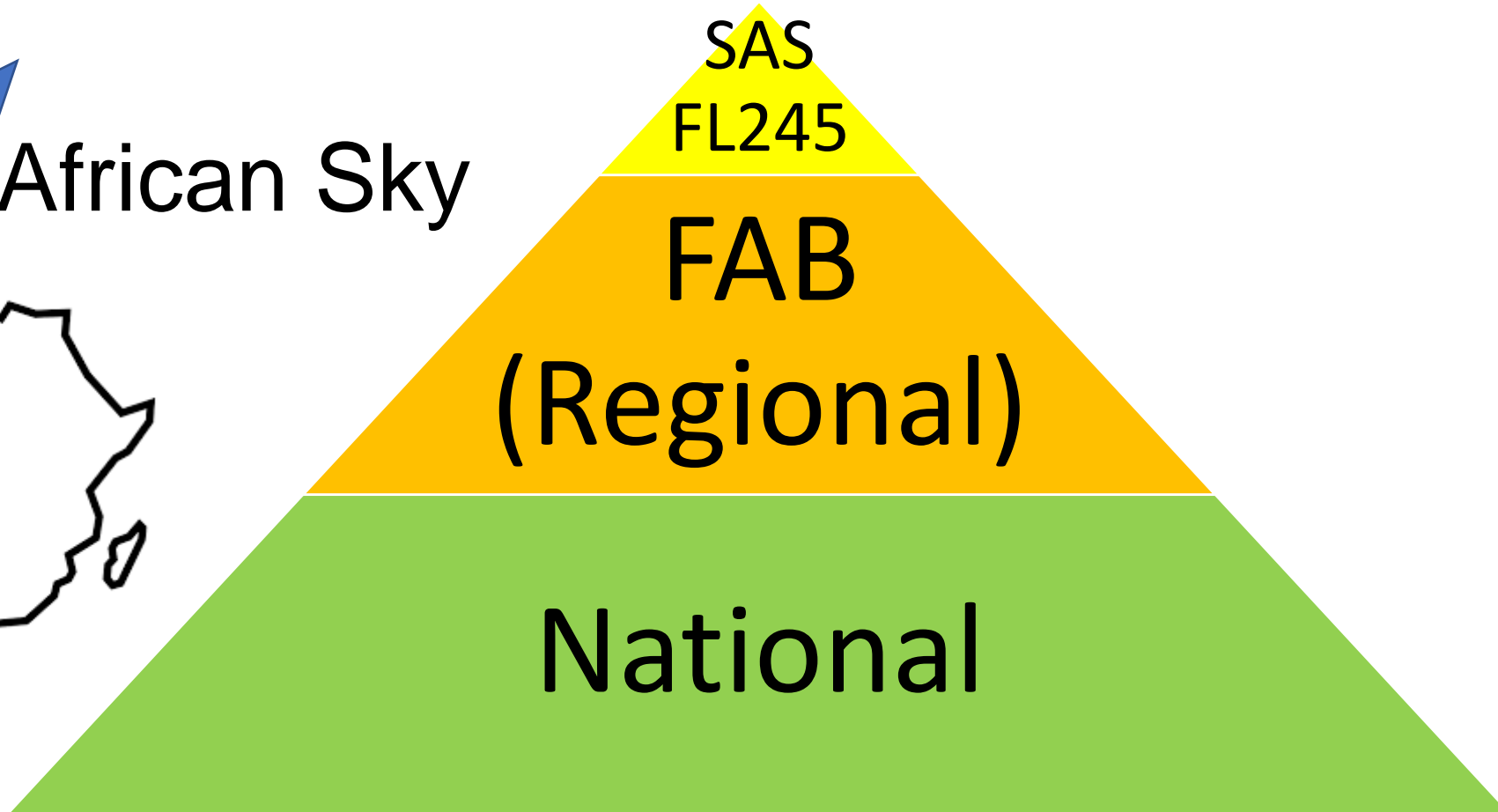
Operators treat as one large FIR

# Free routing

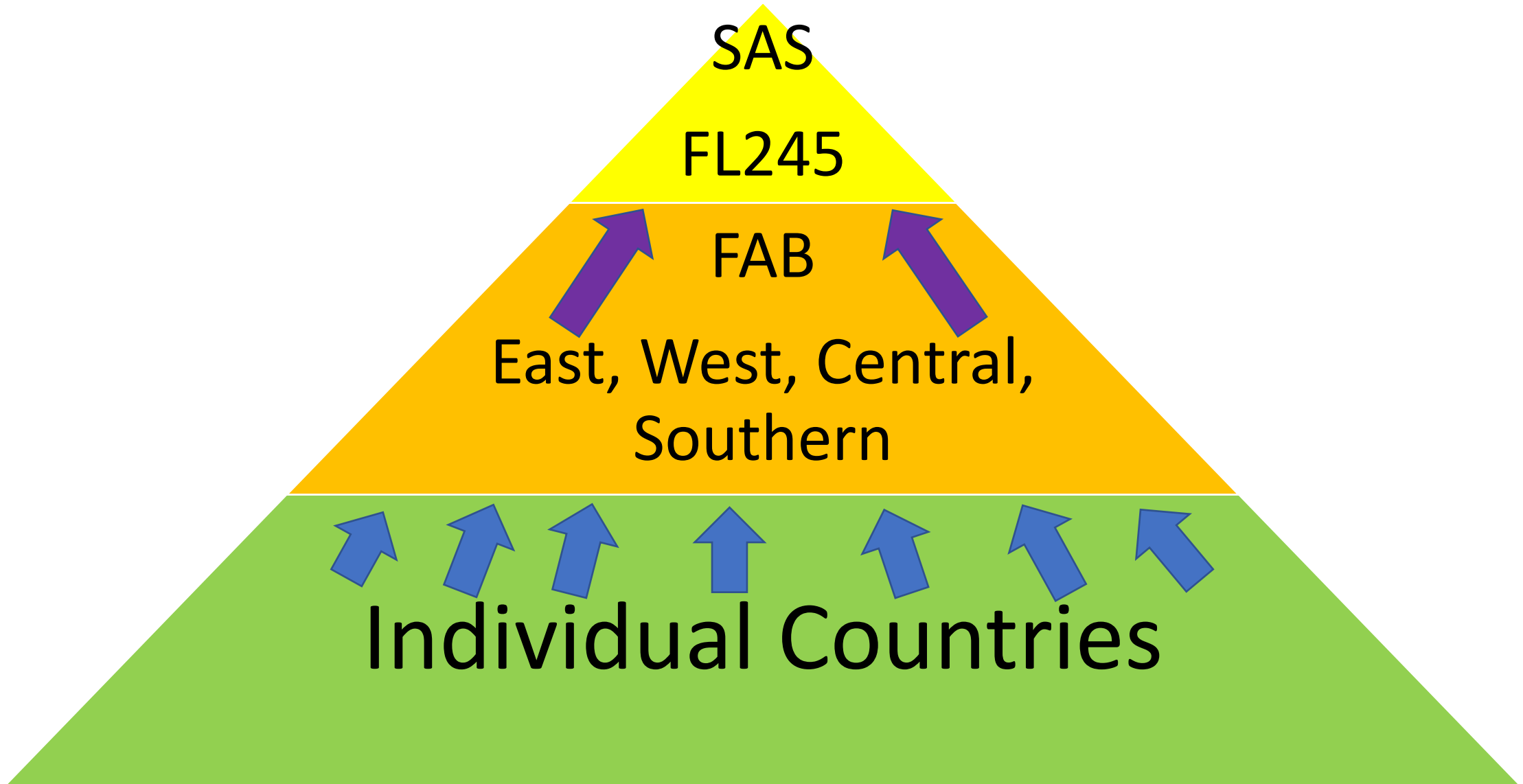
Ultimate



Single African Sky



# Free routing






# Free routing

## Benefits:

- Shorter routes = Reduced flight time
- Reduced CO<sup>2</sup> = Environment friendly
- Low implementation costs – Already supported
- Fewer conflicts – Same number – spread out
- Weight optimisation – Direct routes = less fuel = heavier payload = \$\$\$\$\$\$\$


# Free routing

## Challenges:

- Do not outweigh benefits
  - Conflicts – Harder to detect – traffic spread with increased conflict points
  - Vectoring A/C who planned route with geographical coordinates = issues when instructing crew to resume own navigation
  - Conflicts with entry/exit points between controllers – More vigilant
- 


# Free routing

## Challenges:

- FRA implementation – Coordinated approach, deployed over large areas – Ensure aerodromes don't become bottlenecks.
  - Need enhanced coordination – FRA can extend beyond state borders.
  - AIP (Odd/Even FL's) – May change
- 


# Free routing

## Challenges:

- A/C flying along sector boundaries – Wx avoidance = Loss of separation.
  - Flying near restricted areas – no buffer
  - Sectorisation may have to change with FRA implementation.
  - Lack of fixed routes = blind spots in own sectors and near the borders.
- 

# Free routing

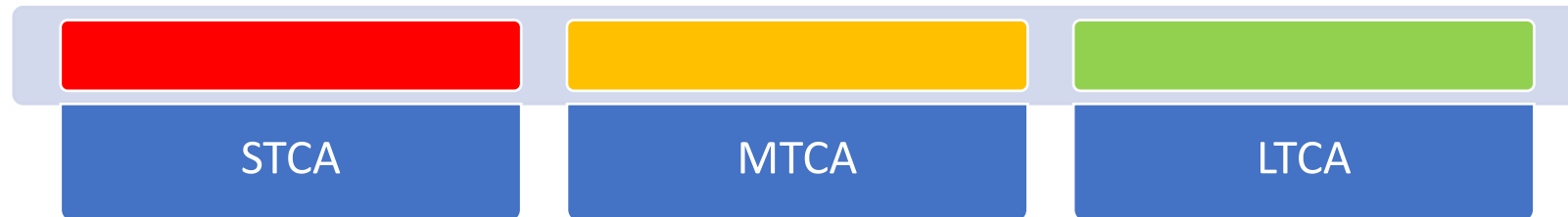
## Mitigation:

- Large scale deployment = Efficiency benefits
  - Gradual implementation = Reduce safety risk
  - Dedicated training – Familiarise with new operational issues.
  - Transferring/Accepting traffic – Ensure A/C are not in conflict.
  - Sector boundary flights – Coordinated.
- 

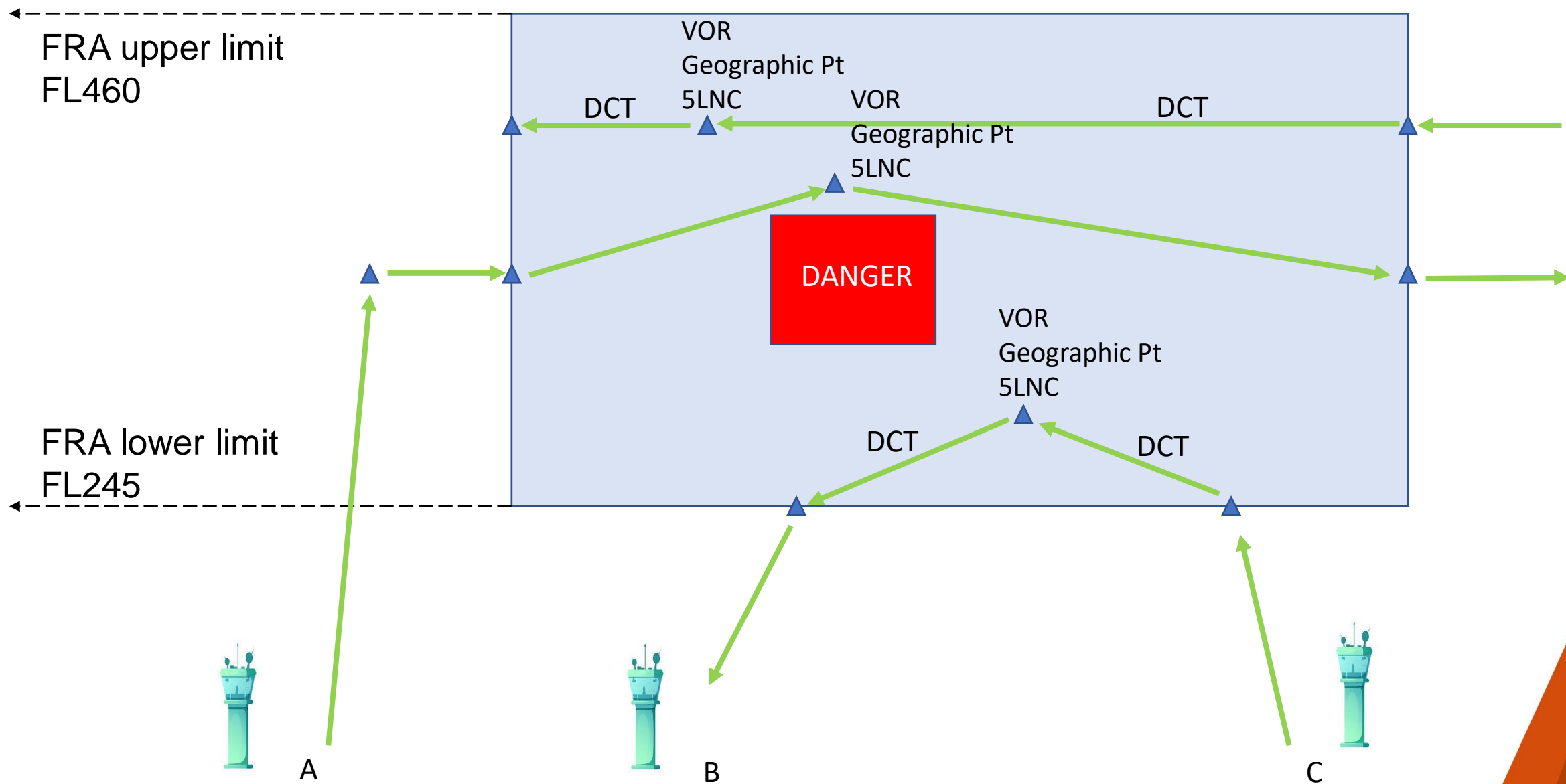
# Free routing

## Mitigation:

- Restricted areas – Must have buffers
- Re-evaluation and optimisation of existing sector definitions may be required.
- Development – Controller support tools




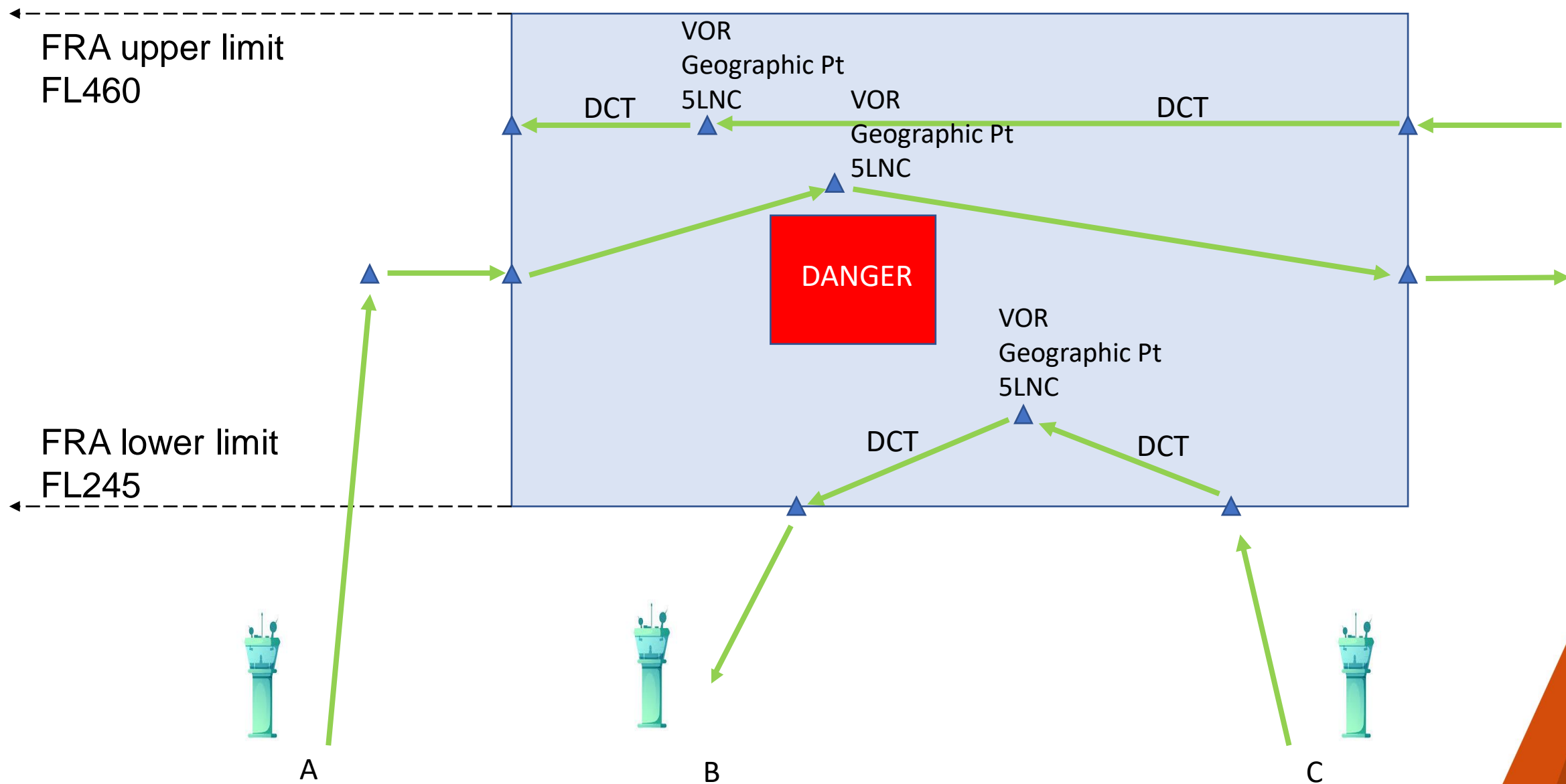




# Poll question


**Implementation of FRA is going to be expensive?**

- a) True
  - b) Possibly
  - c) False
  - d) Not sure
- 




# Free Routing

## Question:

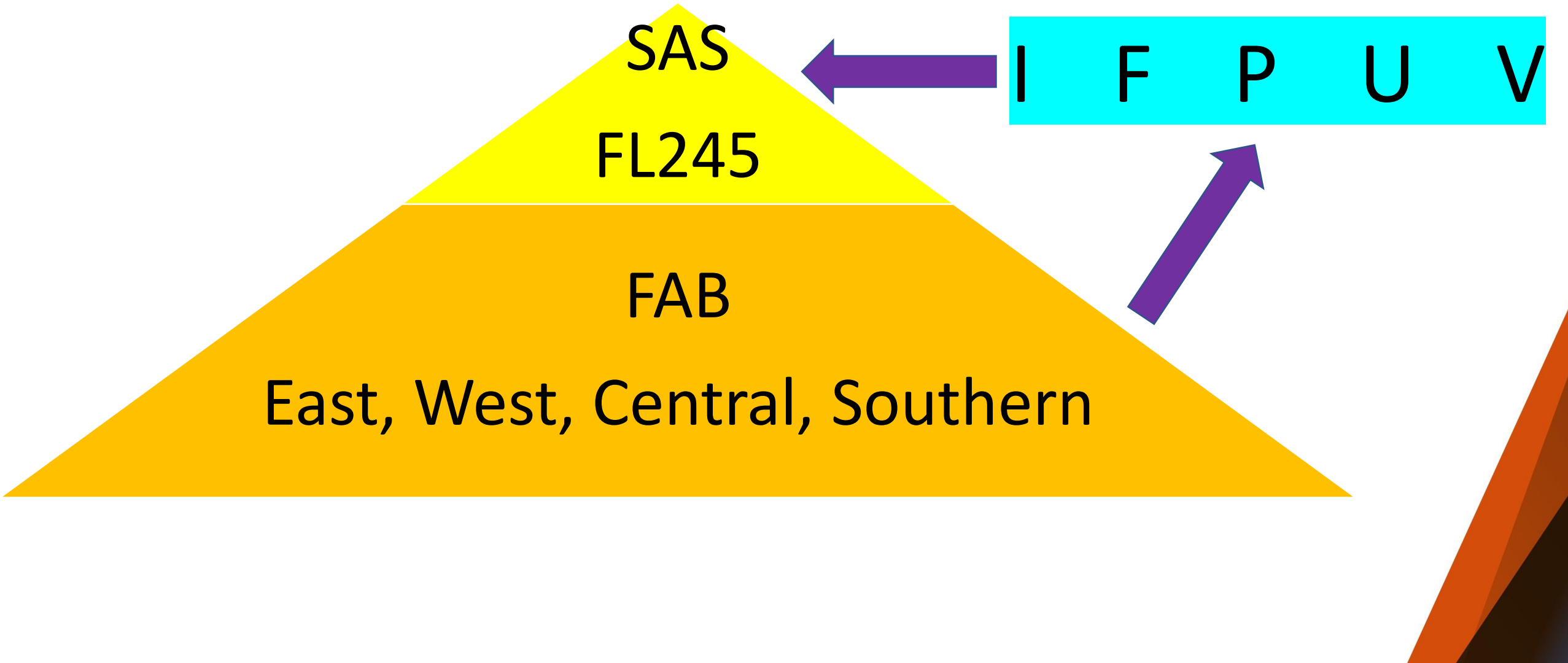
- **How does a pilot who is wanting to fly in FRA know that his route is correct?**
  - Is it entering/exiting at correct points?
  - Is it avoiding segregated airspace
  - Are the geographic points correctly applied?
- 

# Free routing

## IFPUV



- Integrated Initial Flight Plan Processing Validation system.
  - Used by Eurocontrol - Allows pilots to see whether the routing filed complies with requirements of the FRA.
  - Submit flight plan to test system for validation prior to operational submission.
- 

# Free routing






# Free routing

IFPUV Structured Editor  

IFPUV Structured Editor | IFPUV Free Text Editor | Contacts & Support

... 1  Next FPL

▼ FPL Data

[Validate](#) [Propose Routes](#) [Submit](#) [Additional Addresses](#)

▼ FPL Data

DATE OF FLIGHT <input type="text" value="11/06/2020"/>	AIRCRAFT ID <input type="text"/>	FLIGHT RULES <input type="text" value="V"/>	TYPE OF FLIGHT <input type="text" value="V"/>
NUMBER <input type="text"/>	AIRCRAFT TYPE <input type="text"/>	WAKE TURBULENCE CAT <input type="text" value="V"/>	EQUIPMENT <input type="text"/>
ADEP <input type="text"/>	EOBT <input type="text"/>		

ROUTE  
CONTAINING AT LEAST CRUISING SPEED AND LEVEL, FOLLOWED BY DCT (EG: 'N0485F330 DCT')


ADES <input type="text"/>	TOTAL EET <input type="text"/>	ALTN AERODROME <input type="text"/>	2ND ALTN AERODROME <input type="text"/>
------------------------------	-----------------------------------	--	--

OTHER INFORMATION [CLICK HERE TO ENTER DATA](#)

SUPPLEMENTARY INFORMATION [CLICK HERE TO ENTER DATA](#)

# Free routing

## IFPUV

- Flight plan pre-validation, are not stored.
  - Manual correction not possible, response is automatic.
  - IFPUV routes – Not “NM recommended”
  - Is not a flight planning tool.
  - Flight plan originator responsibility for operational acceptance.
- 

# Free routing

## SAS

- Future concept – Aligning ourselves
- **Enablers:**
  - a) AIDC – ATS inter-facility data comms
  - b) DATA management – FIXM, DATM, CDM
  - c) ATFM – E.g. Mombasa project
  - d) APIRG resolutions

IFPUV



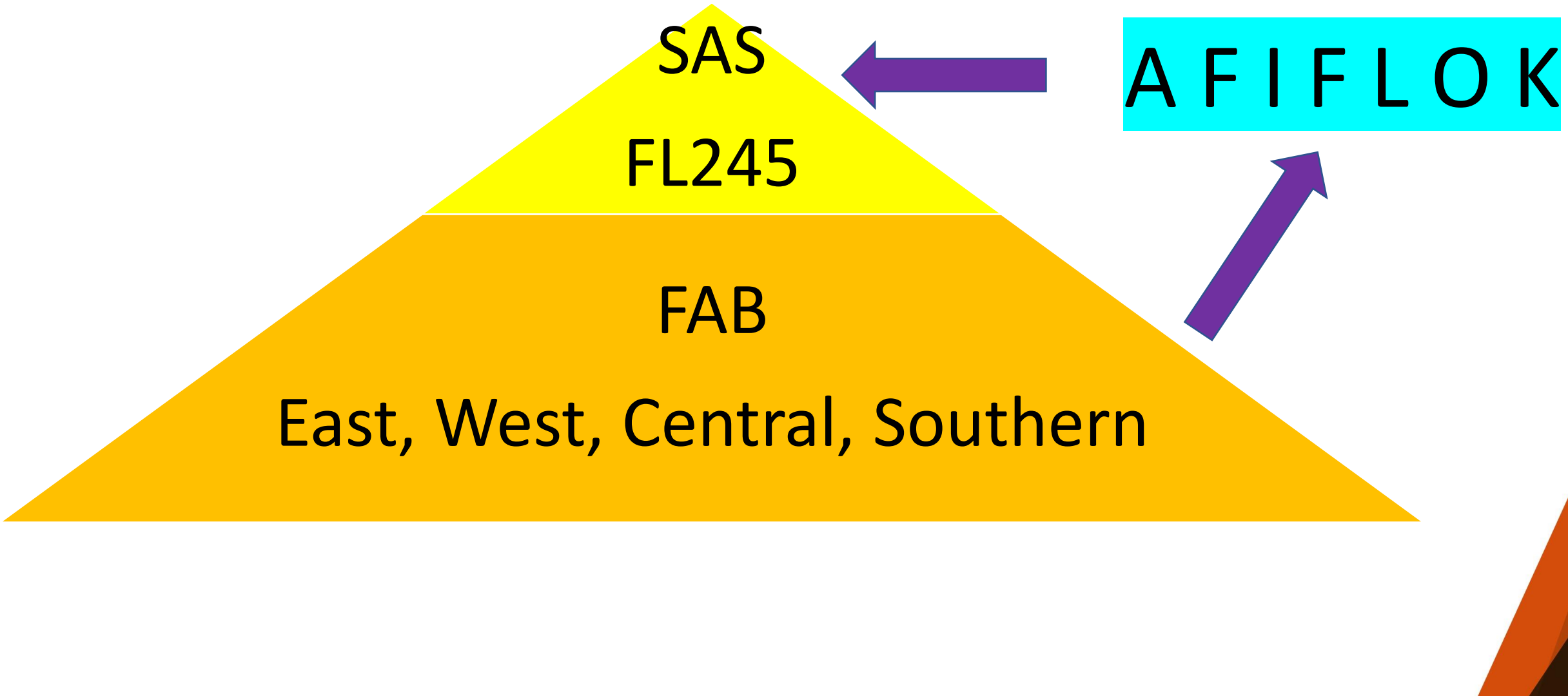
AFIFLOK



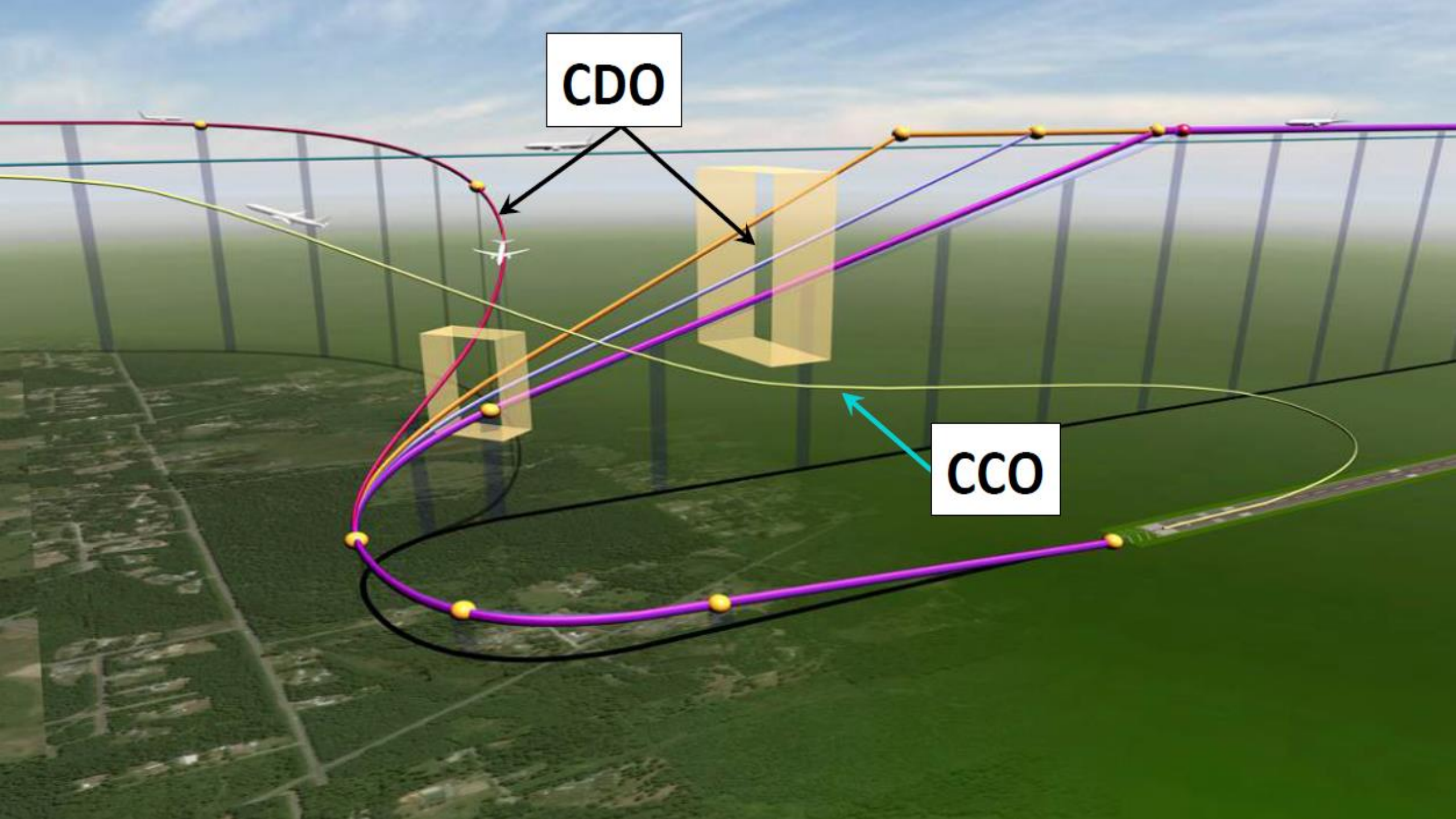
AFI region Flight Plan OK



# Free routing

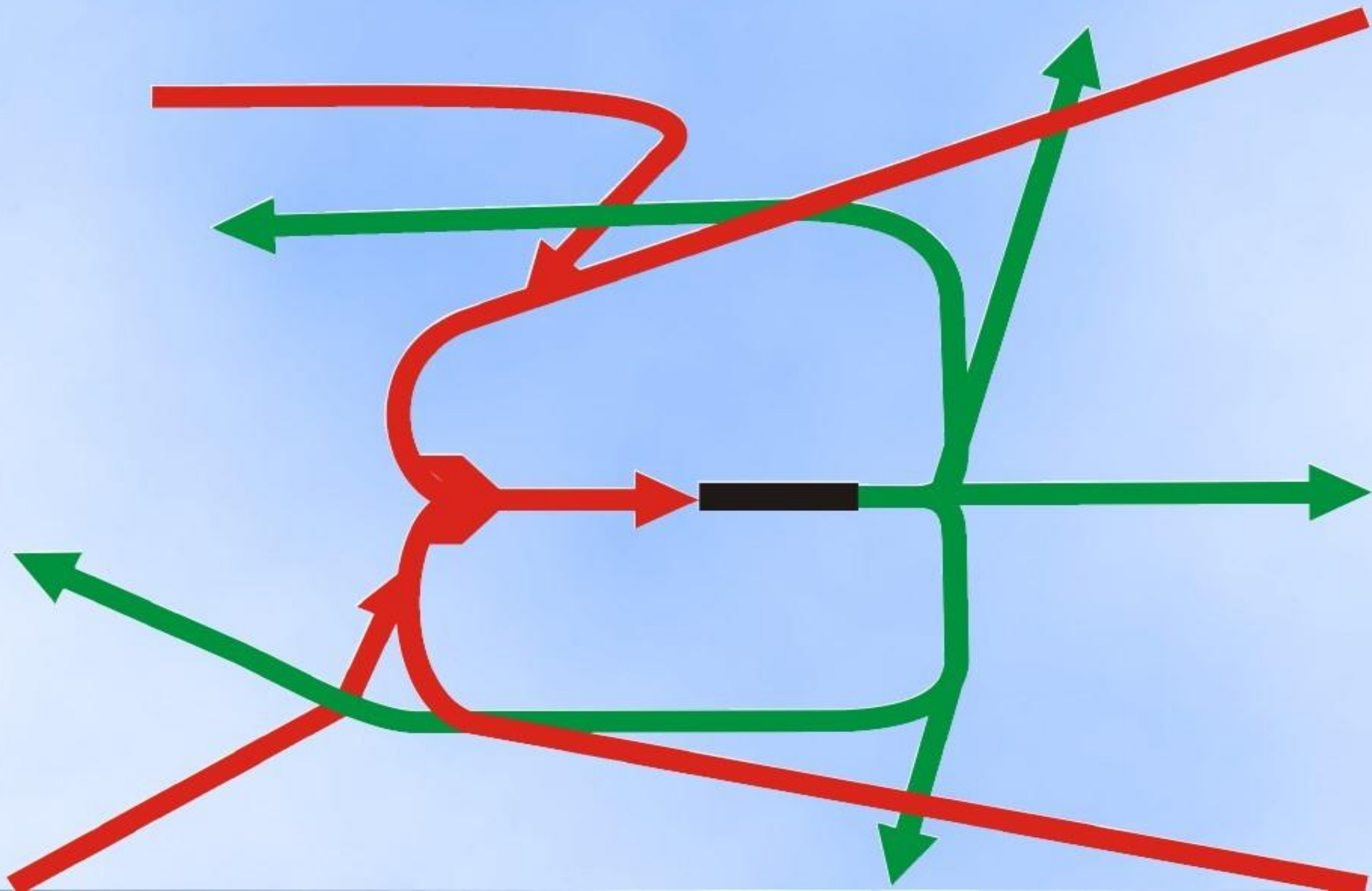


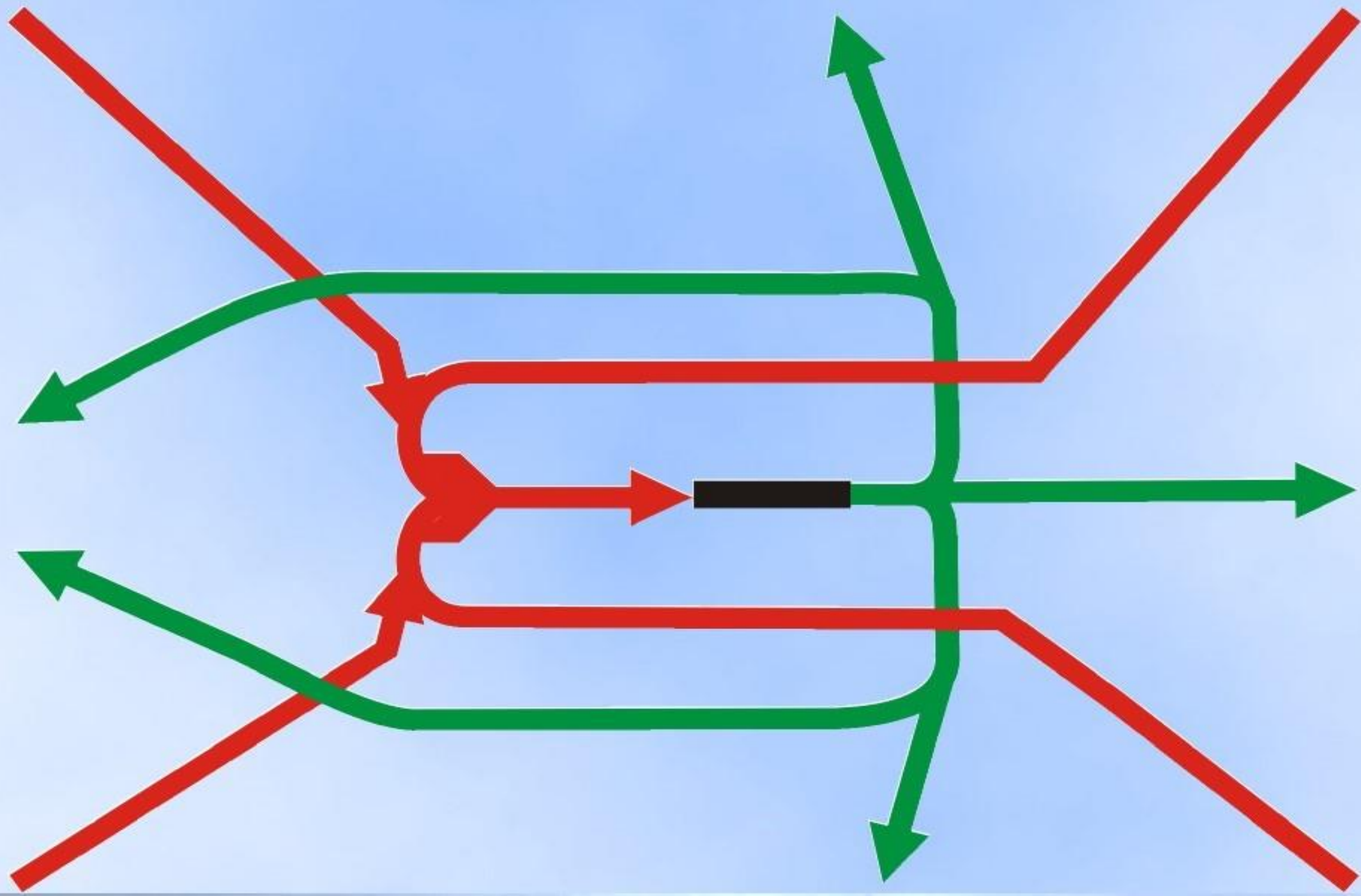




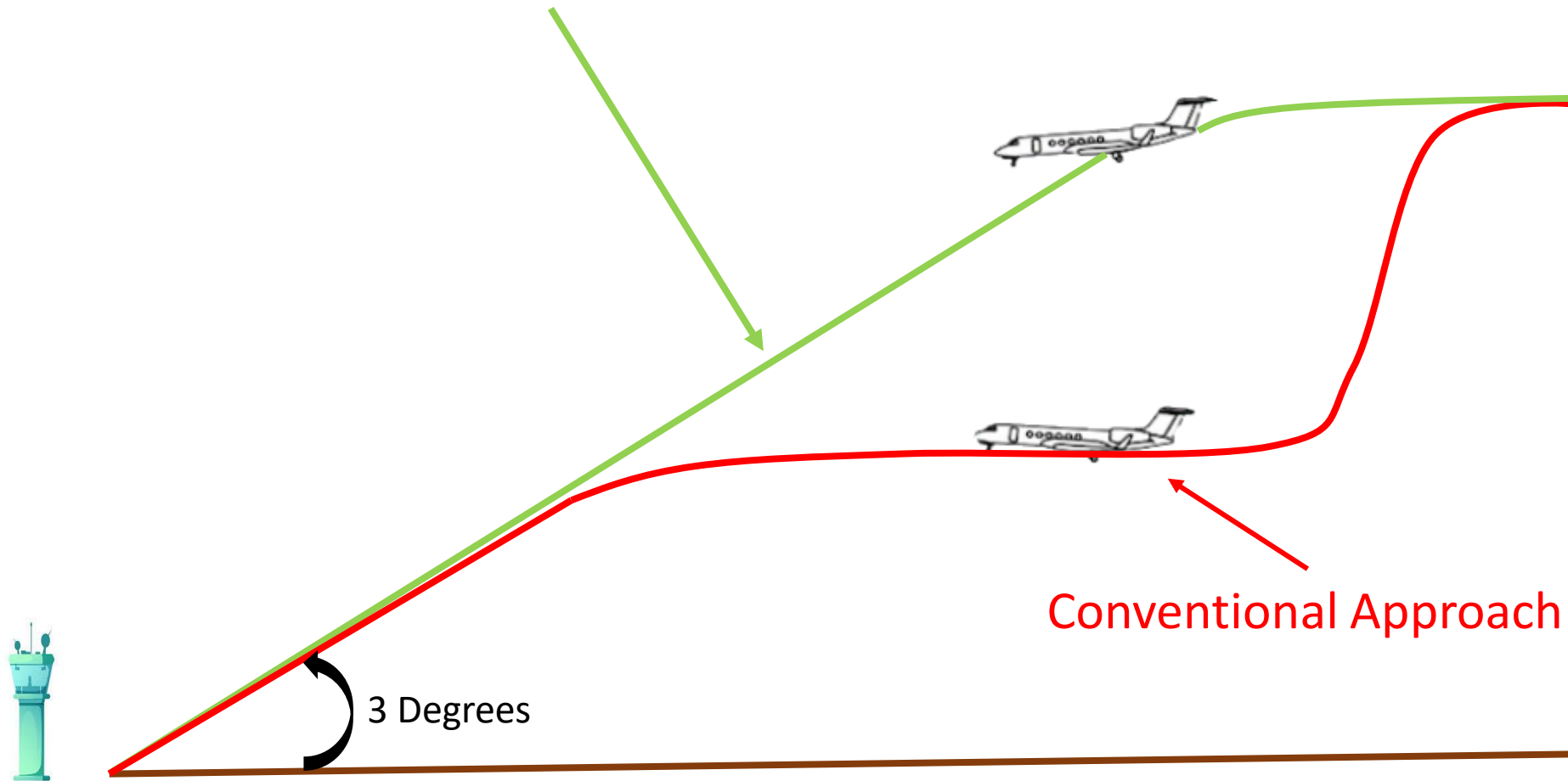
**CDO**

**CCO**



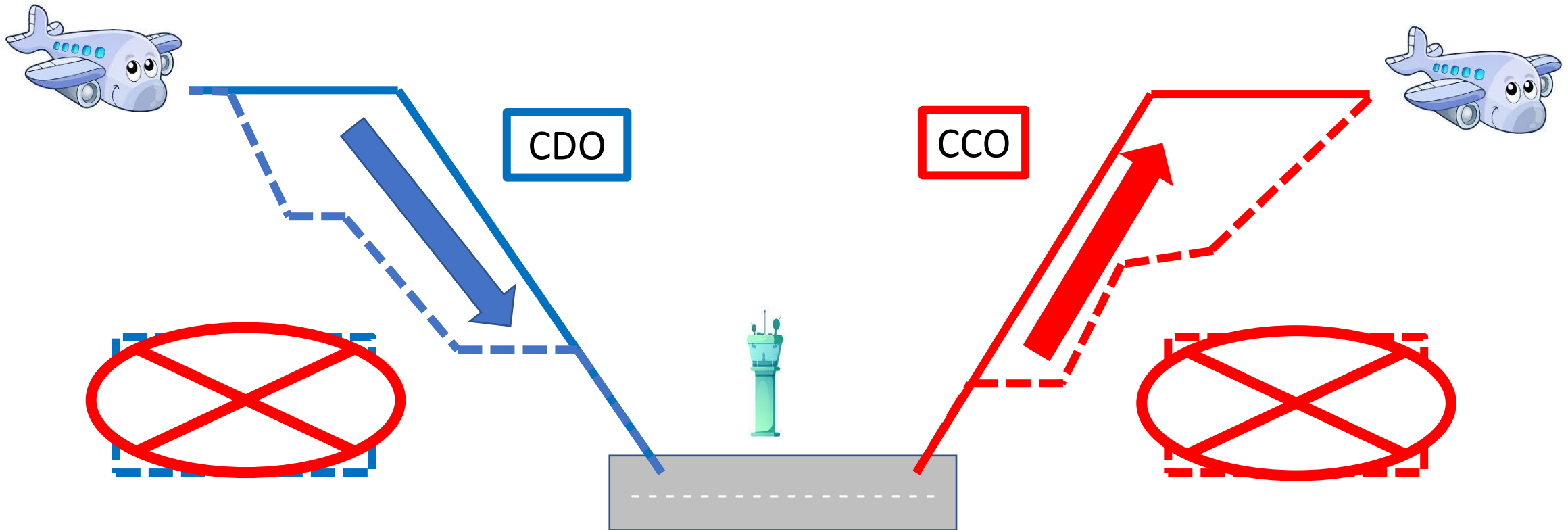


## Continuous Descent Operations (CDO)





# CCO/CDO



# CCO/CDO

**No CDO operations**

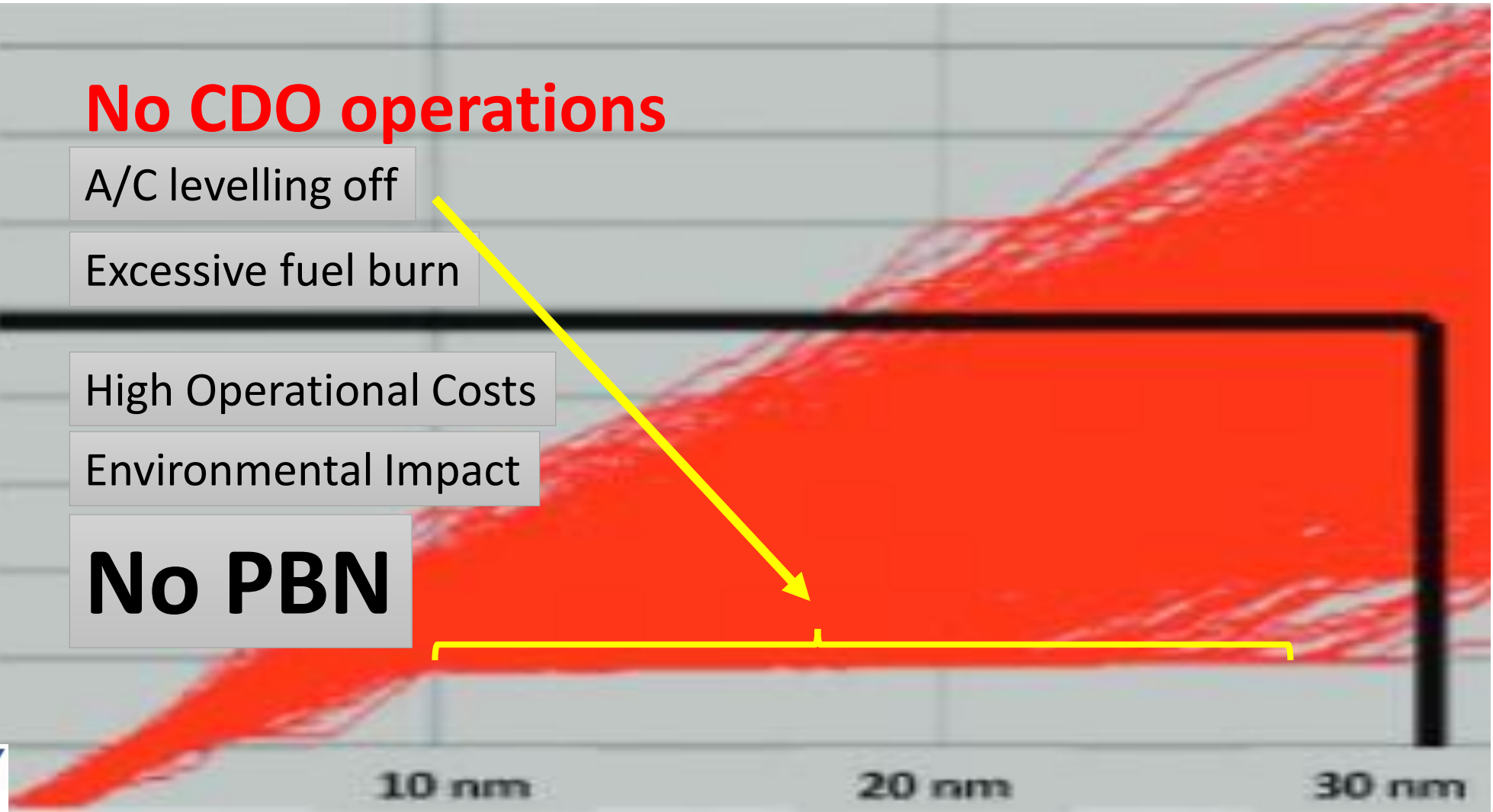
A/C levelling off

Excessive fuel burn

High Operational Costs

Environmental Impact

**No PBN**





# CCO/CDO

## CDO operations

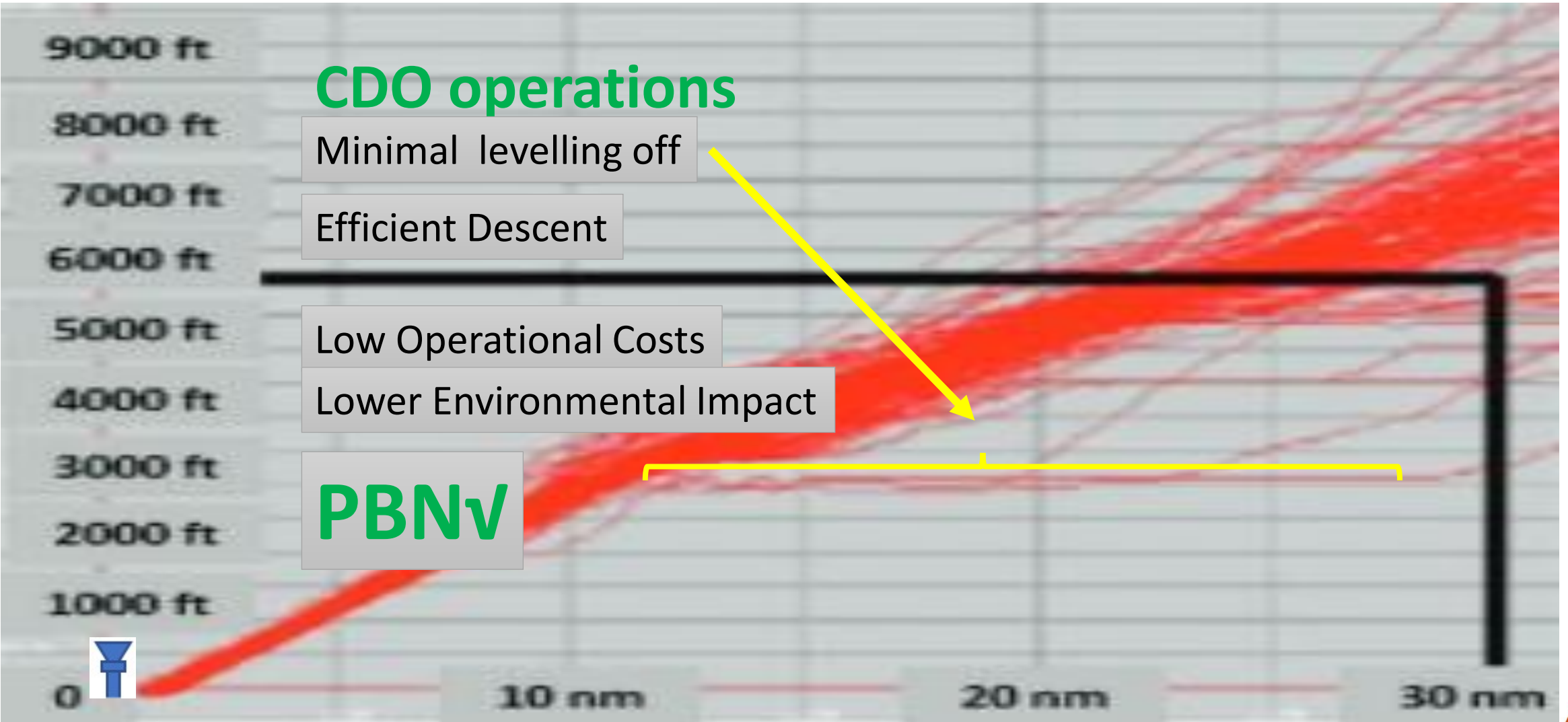
Minimal levelling off

Efficient Descent

Low Operational Costs

Lower Environmental Impact

## PBNv





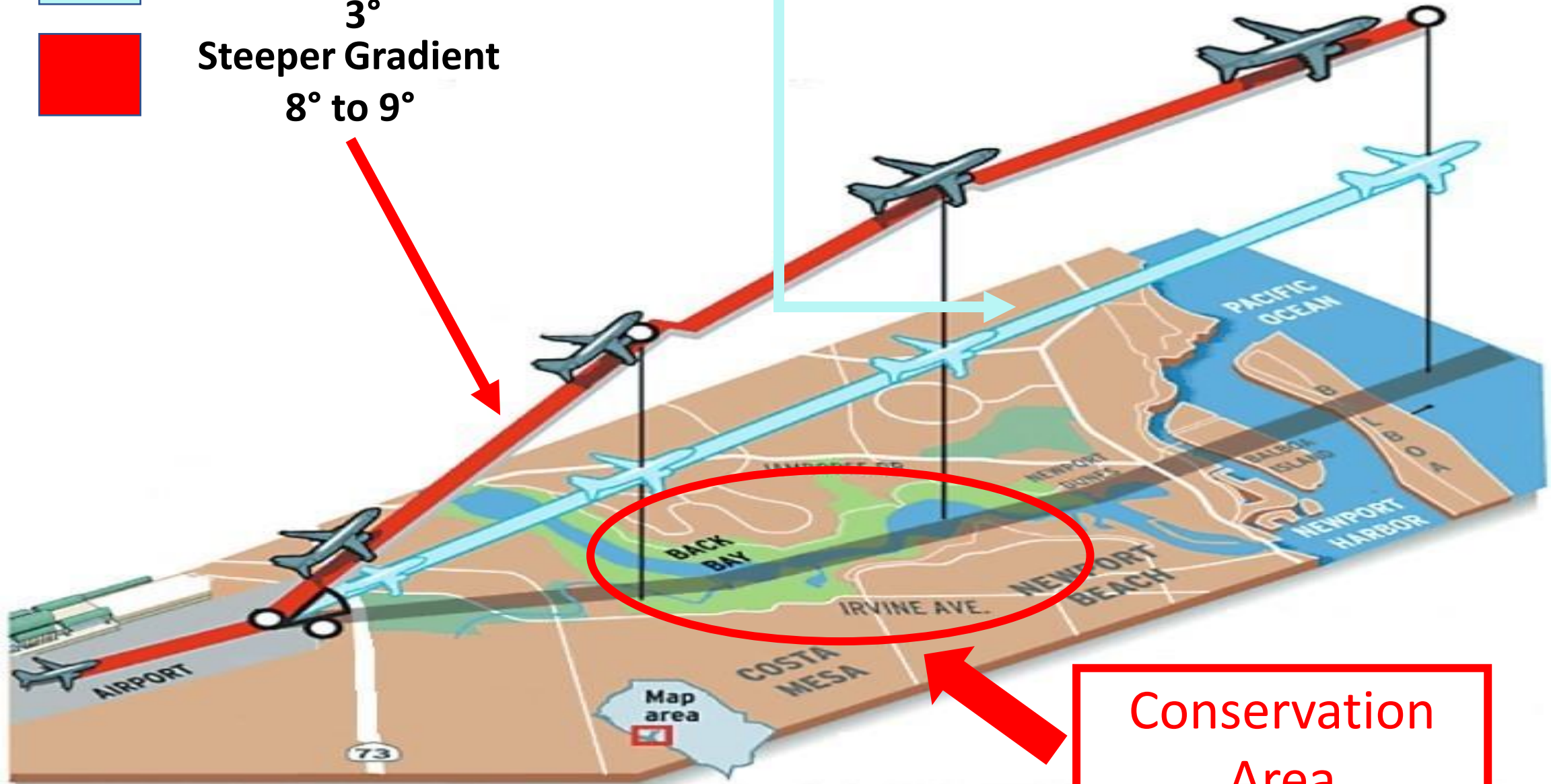
Standard Gradient

3°



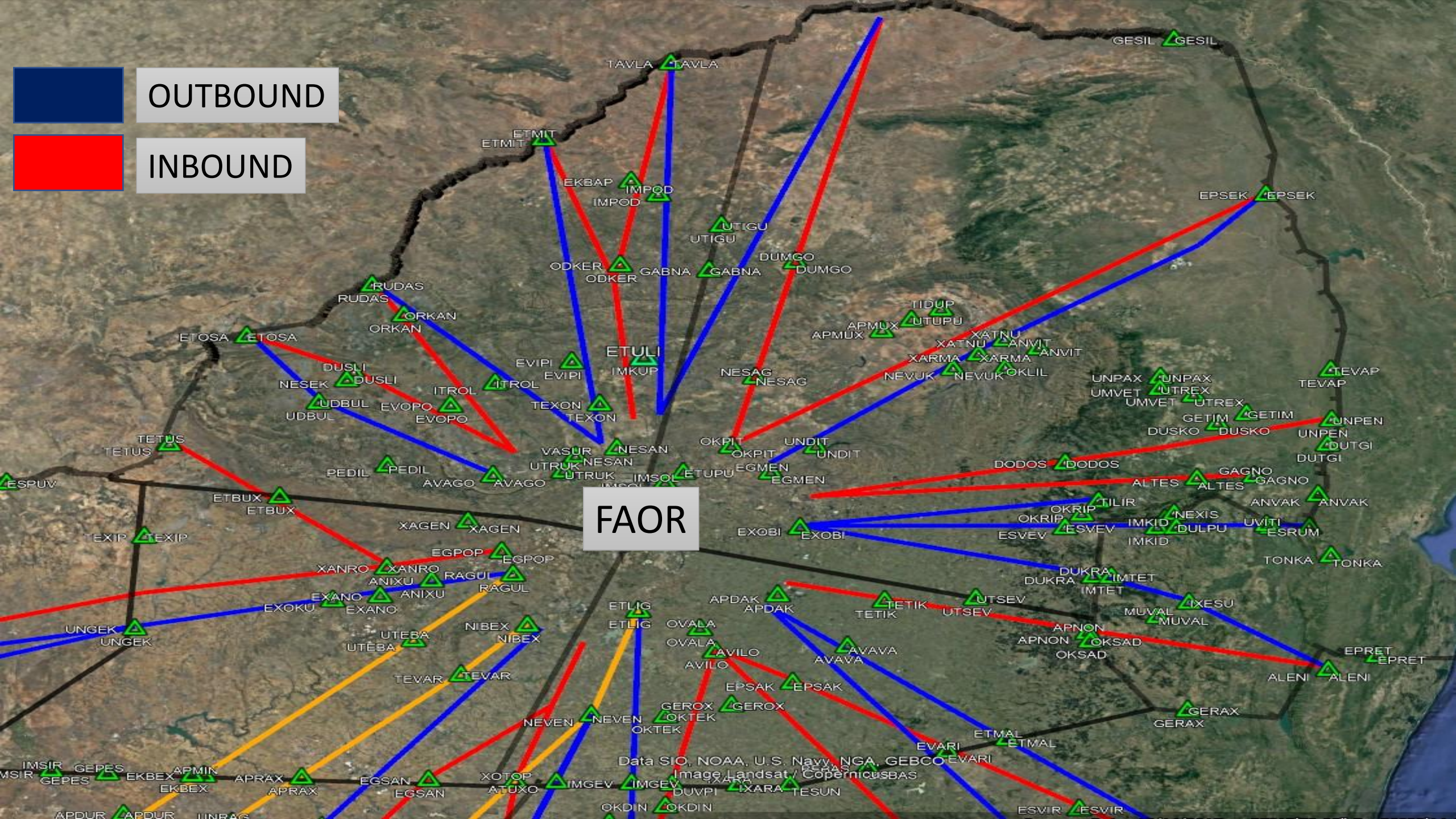
Steeper Gradient

8° to 9°

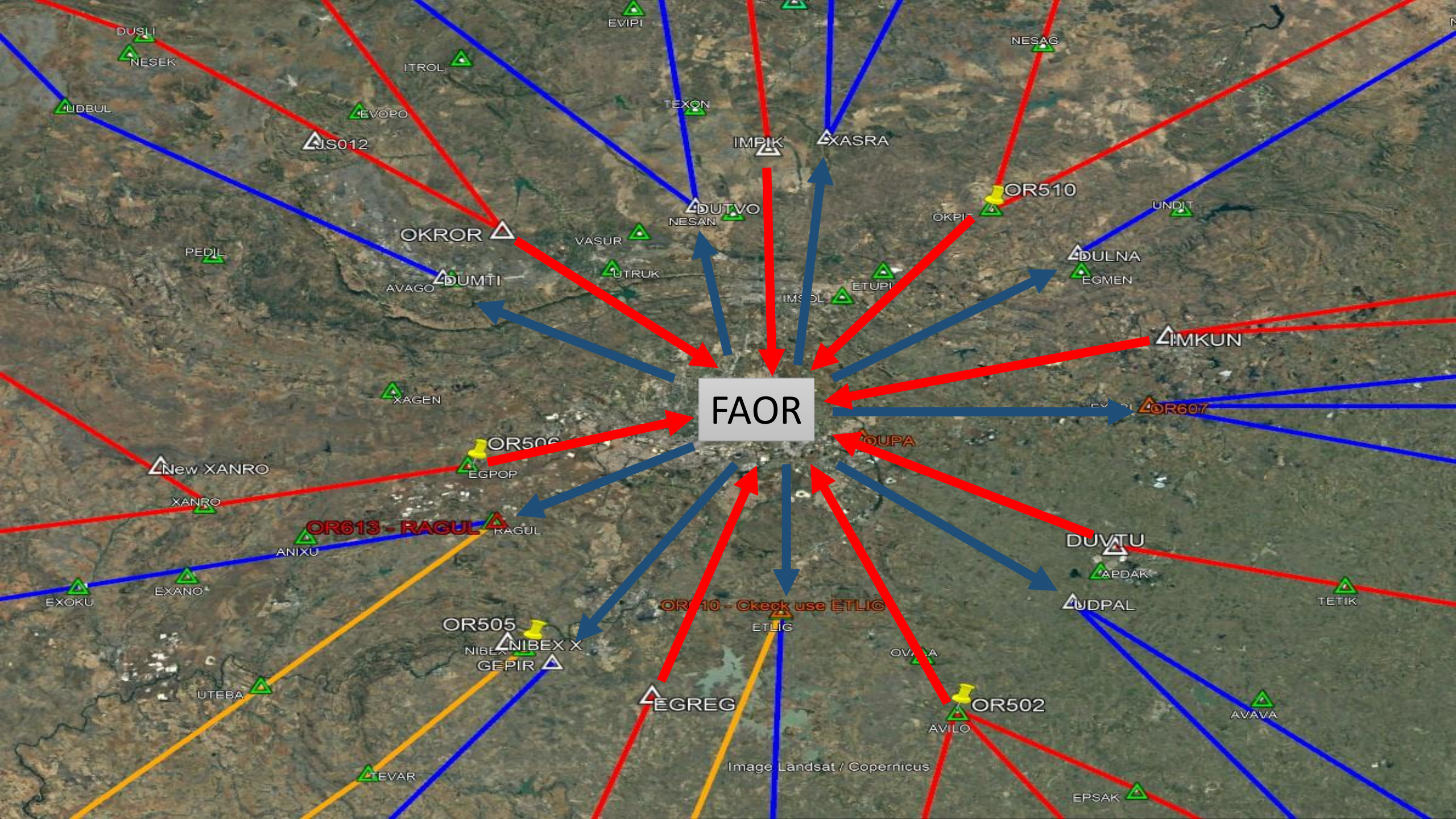


Conservation  
Area





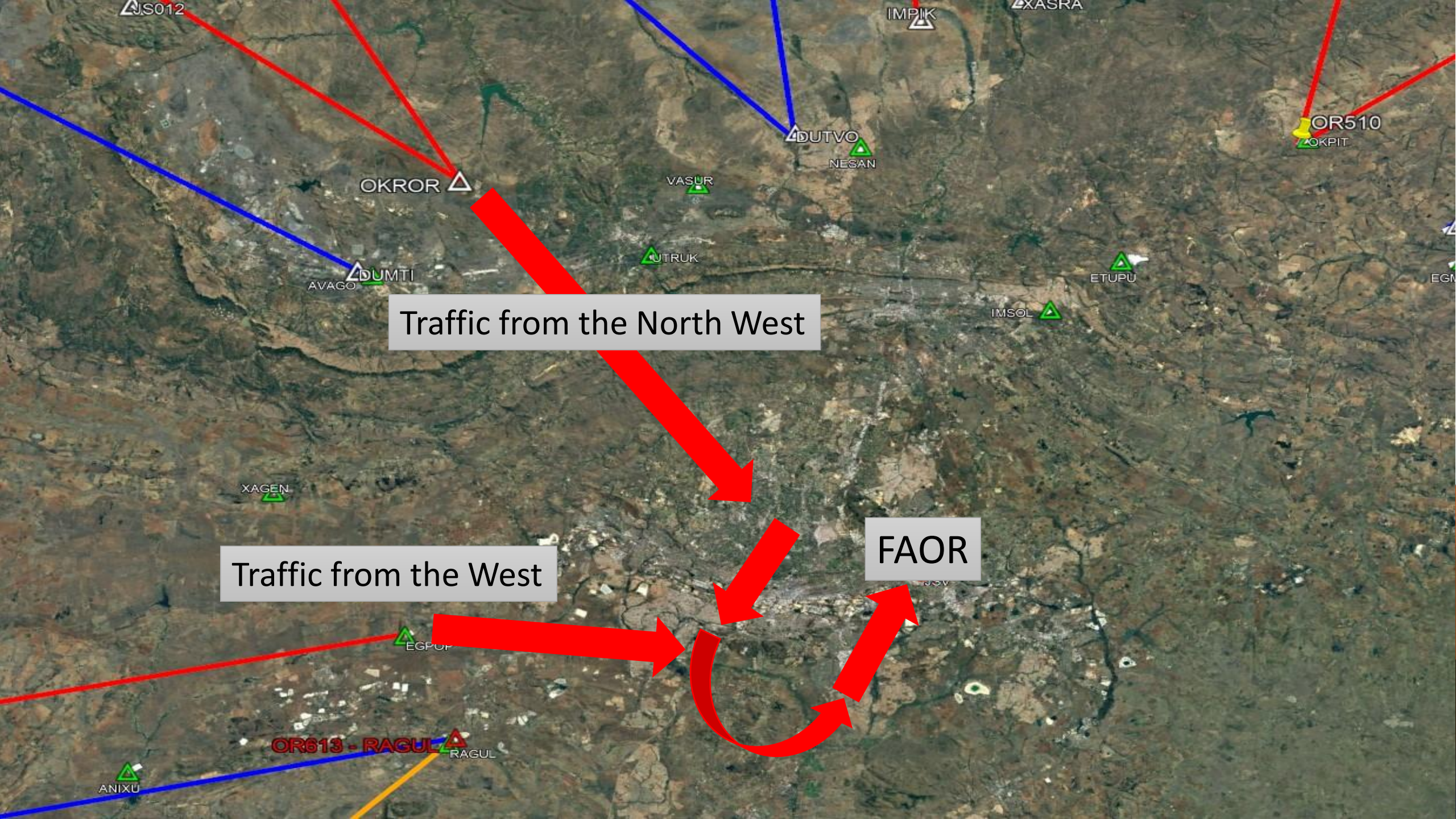






RWY 03  
Johannesburg to Cape Town  
Busiest route





OKROR

AVAGO  
DUMTI

VASUR

UTRUK

DUTVO  
NESAN

IMSOL

ETUPU

OR510  
OKPIT

XAGEN

Traffic from the West

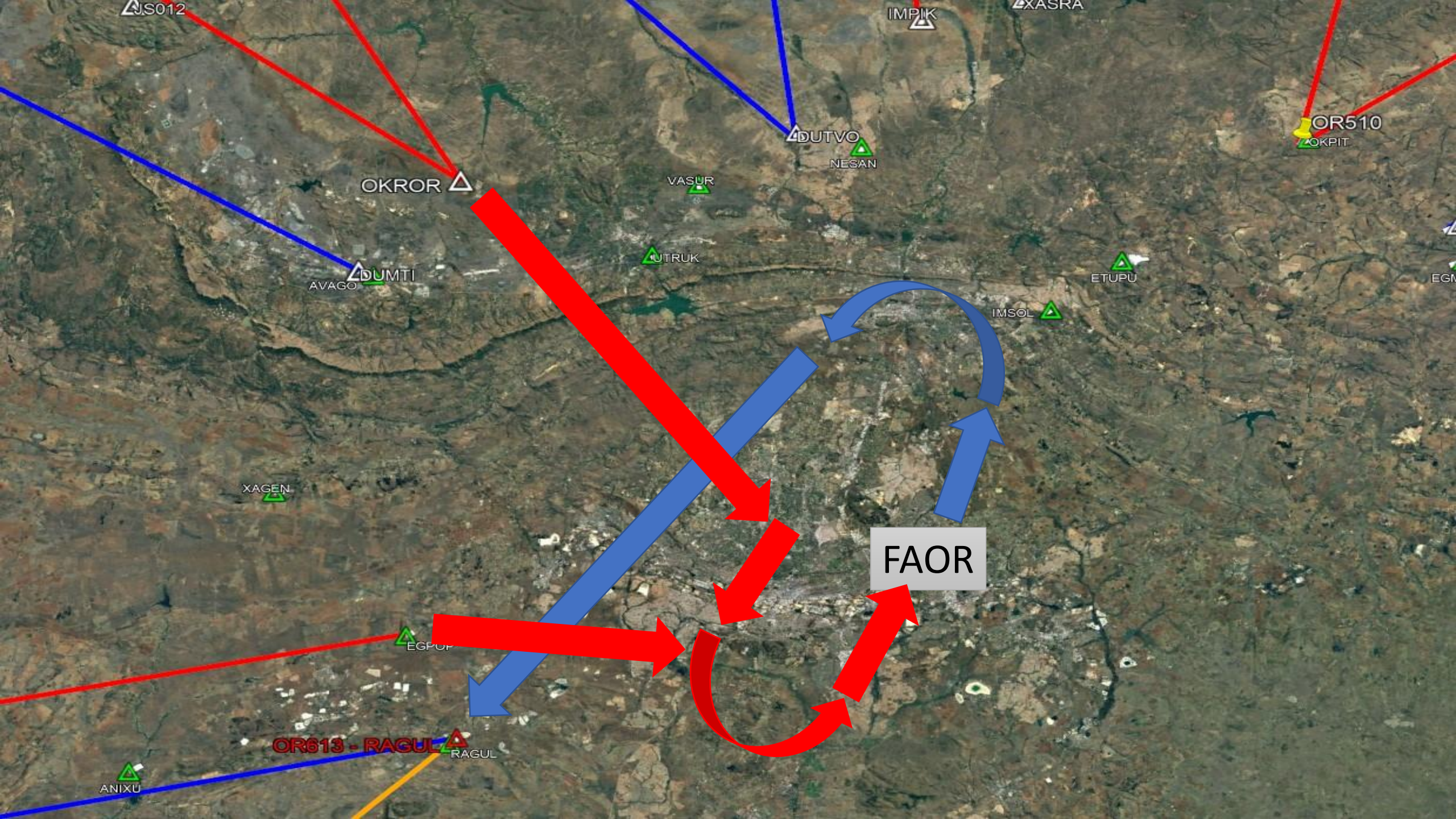
EGPOT

OR613 - RAGUL  
RAGUL

ANIXU

FAOR










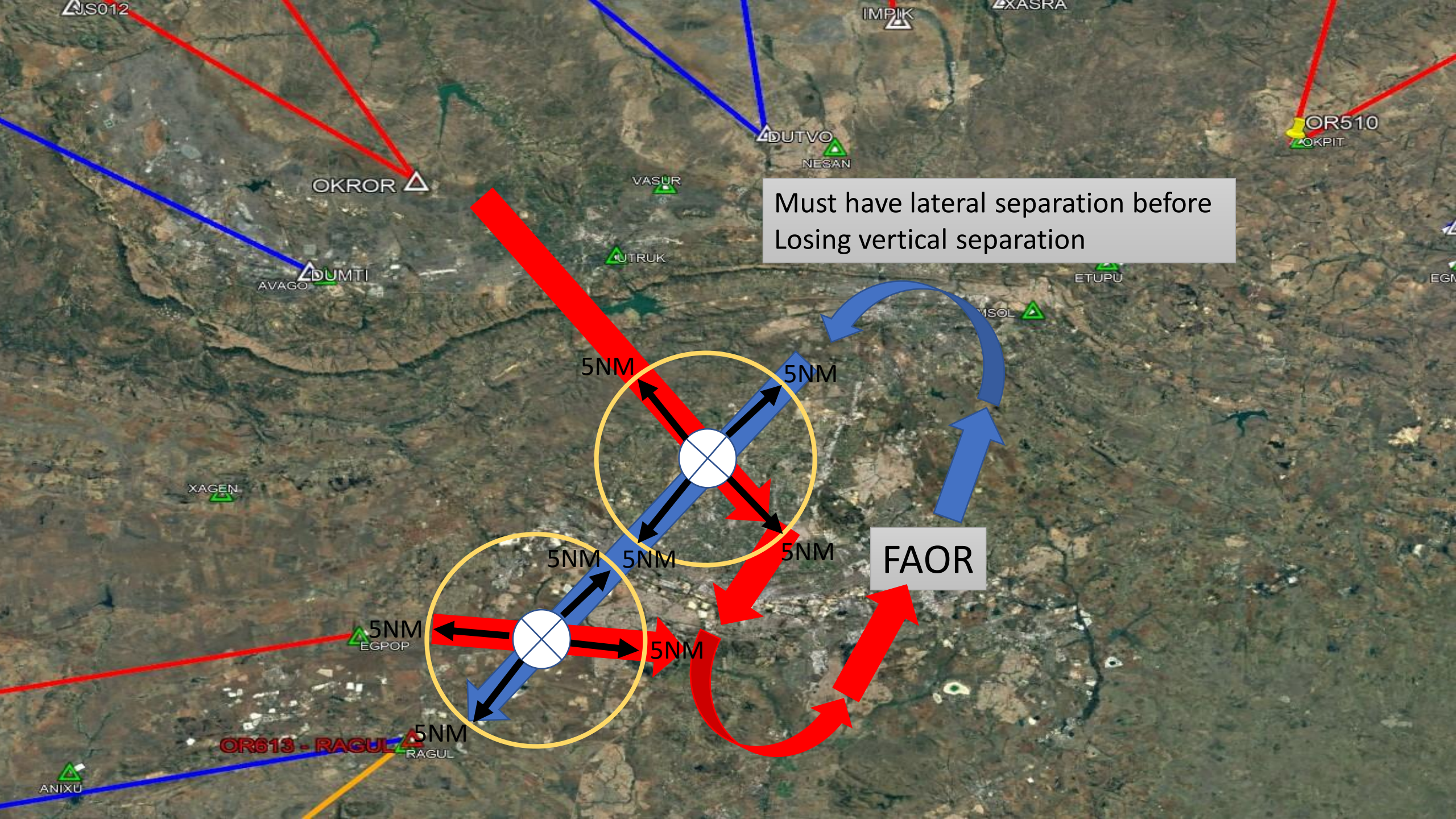


# Poll question

**SID's and STAR's should ideally cross at which angle?**

- a)  $45^\circ$
  - b)  $70^\circ$
  - c)  $90^\circ$
  - d)  $120^\circ$
- 

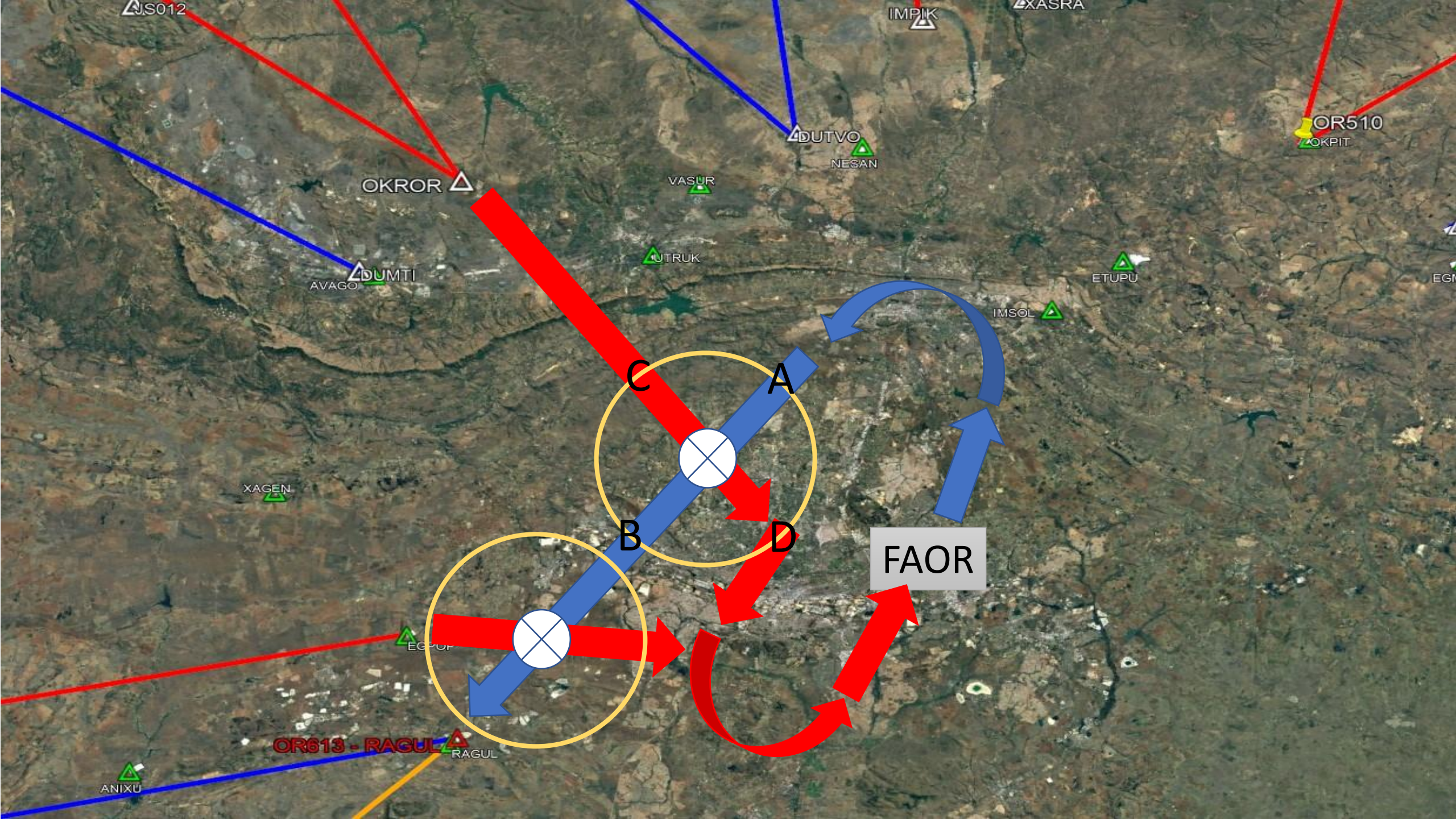




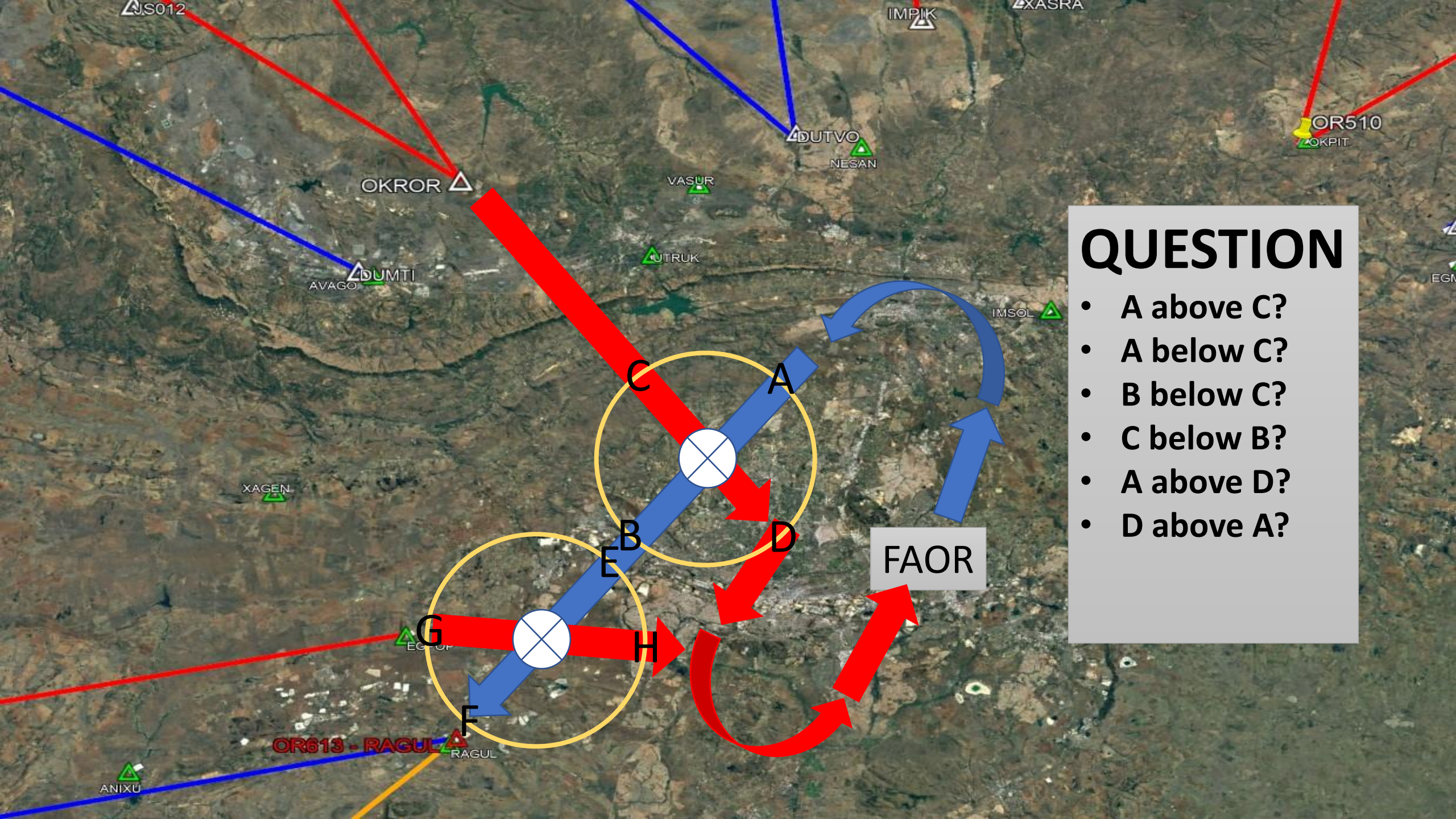
Must have lateral separation before  
Losing vertical separation

FAOR









# QUESTION

- A above C?
- A below C?
- B below C?
- C below B?
- A above D?
- D above A?



# CCO/CDO

## ANSWER:

- PDG (Performance Design Gradient).
- Use standard 3° climb/descent gradient.
- SID – Measure from RWY upwind threshold to crossing point.
- STAR – Measure from RWY threshold backwards to crossing point.
- Good idea if SID/STAR is above or below





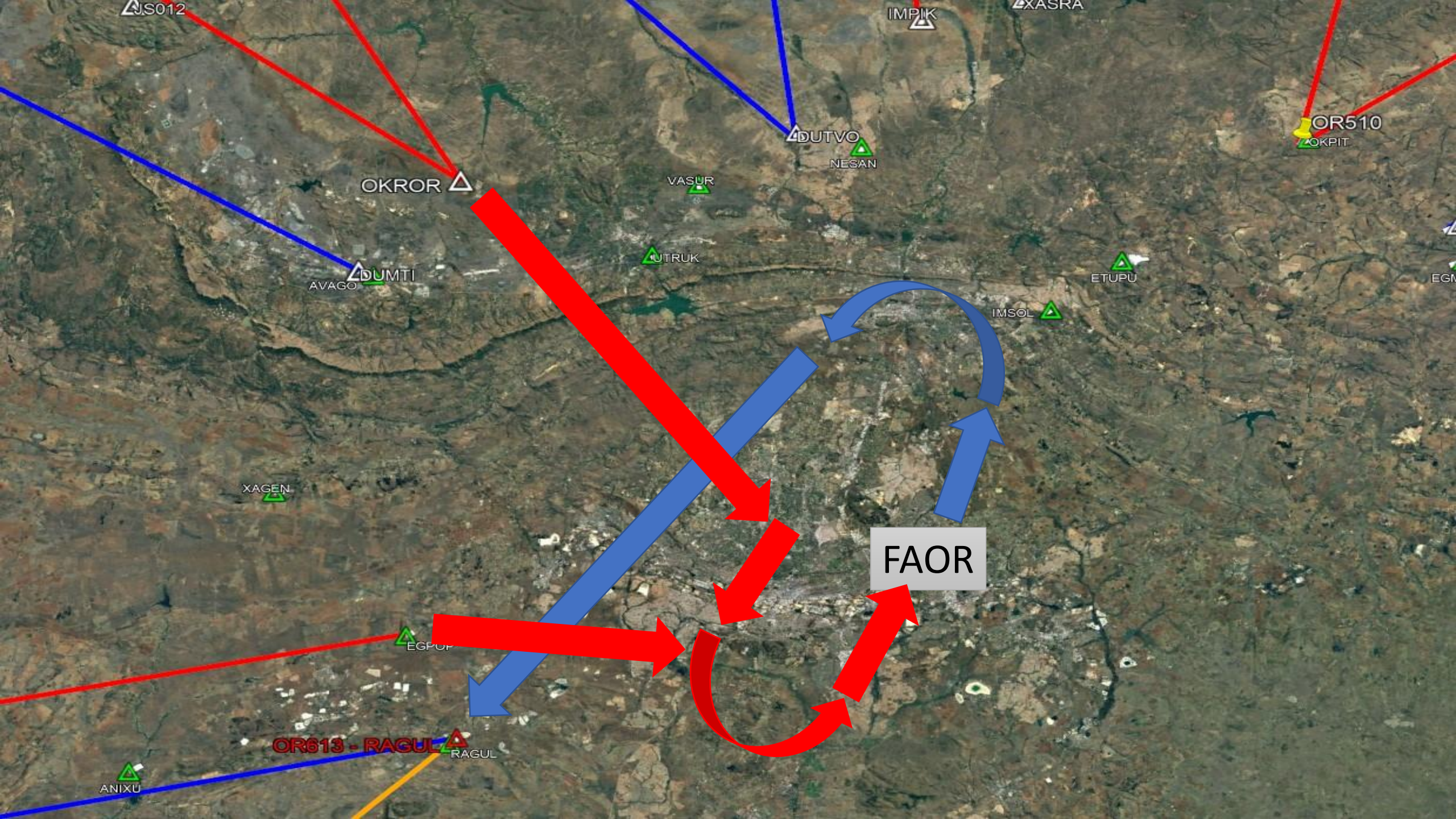
Upwind threshold

- Measure from thresholds to crossing point of SID and STAR
- Use PDG 3° for Sid/STAR
- Good idea who should be above and below

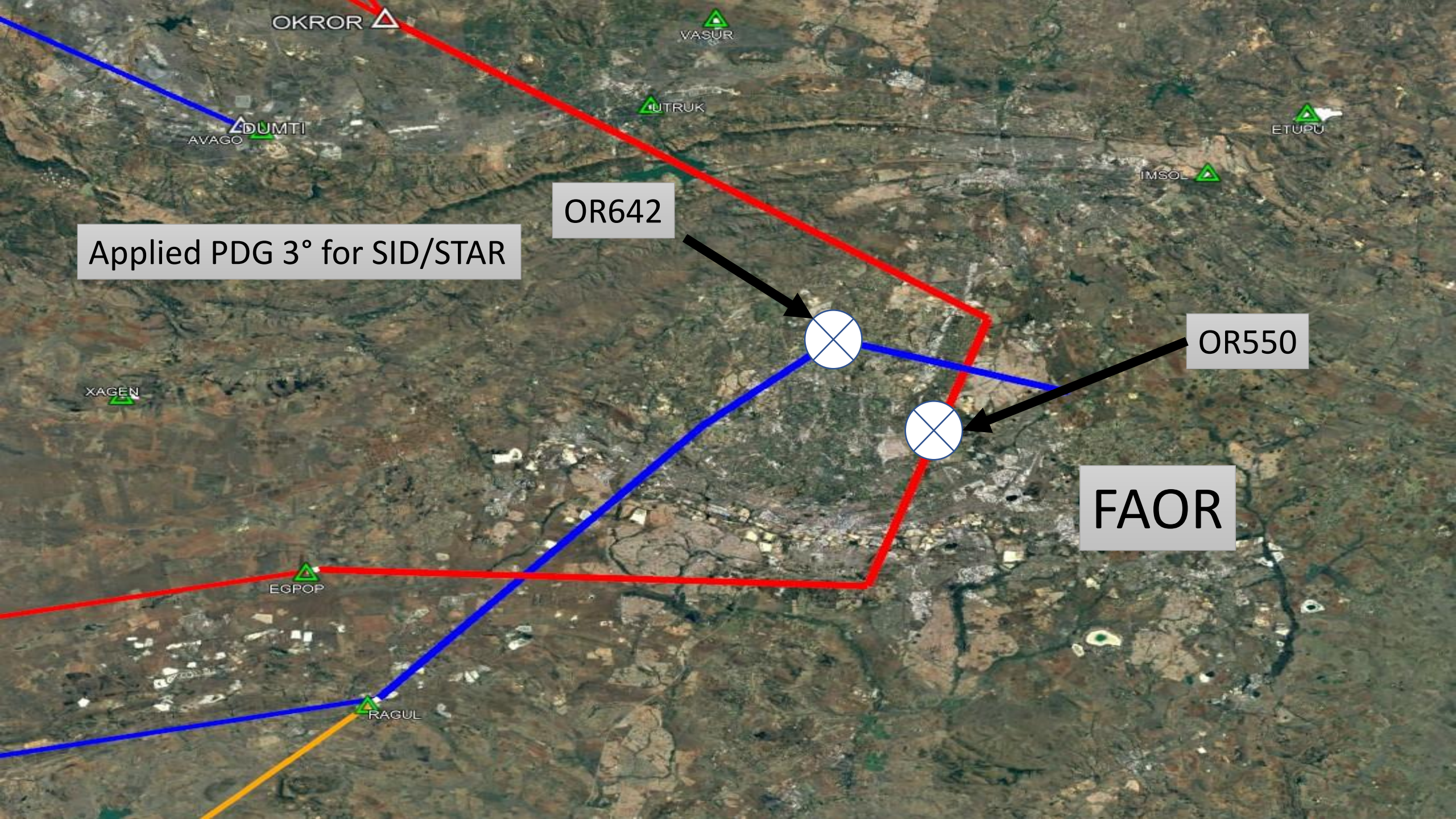
FAOR  
RWY 03L

Threshold









OKROR

VASUR

UTRUK

ETUPU

IMSOL

AVAGO  
DUMTI

OR642

Applied PDG 3° for SID/STAR

OR550

FAOR

XAGEN

EGPOP

RAGUL

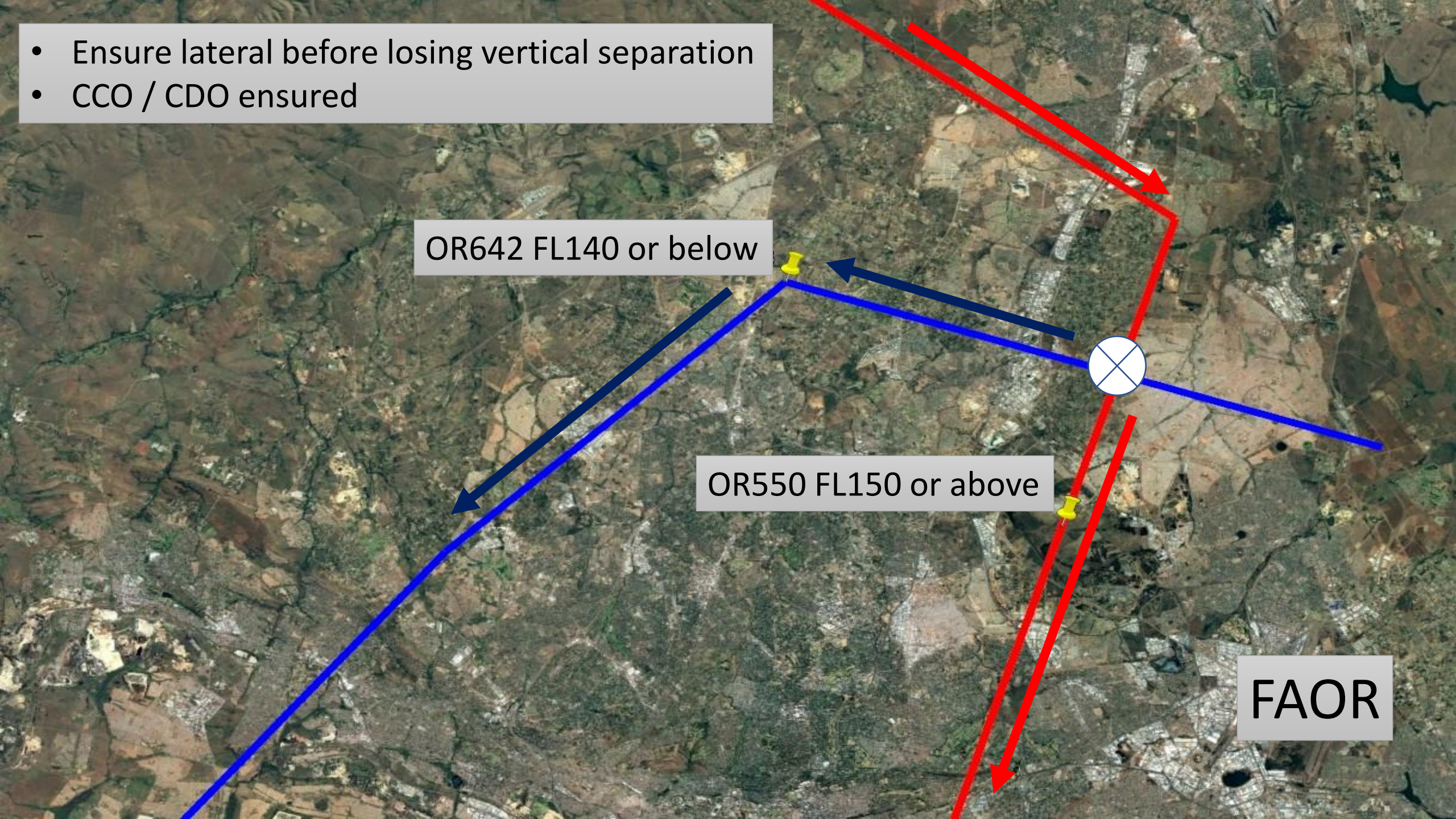


- Ensure lateral before losing vertical separation
- CCO / CDO ensured

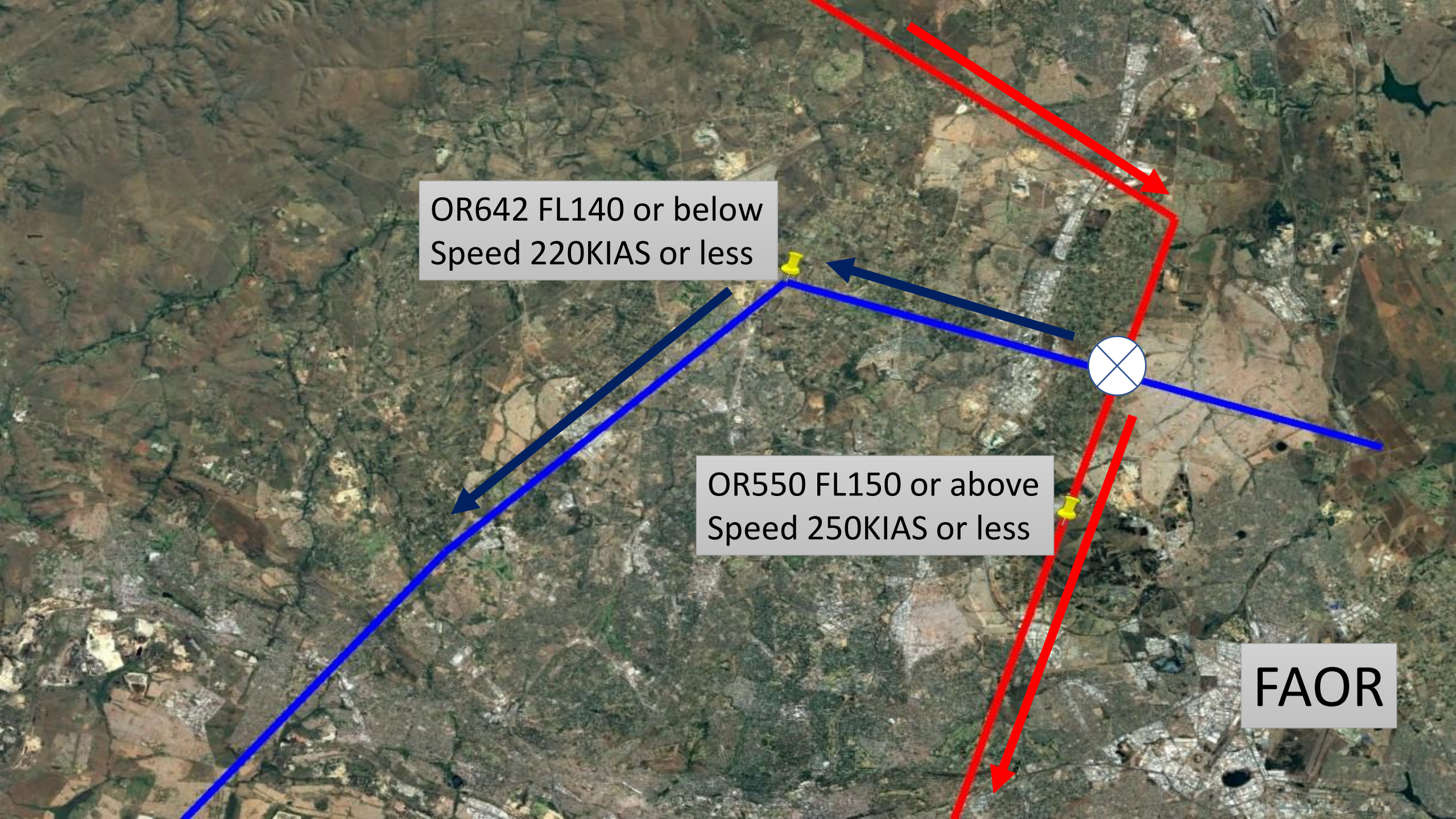
OR642 FL140 or below

OR550 FL150 or above

FAOR







OR642 FL140 or below  
Speed 220KIAS or less

The image is an aerial photograph of a landscape with fields and some buildings. A blue line with arrows indicates a flight path starting from the bottom left, moving towards the center, and then branching. A red line with arrows indicates another flight path starting from the top right, moving towards the center, and then branching. A white circle with a black 'X' is located at the intersection of the two paths. Two yellow pushpins are placed on the paths: one on the blue path near the center and one on the red path near the bottom right. Text boxes provide specific flight parameters for each path. The label 'FAOR' is in the bottom right corner.

OR550 FL150 or above  
Speed 250KIAS or less

FAOR





# Questions and Answers





**Ms. Keziah Ogutu**

**Regional Officer, Air Traffic  
Management**

**ICAO - ESAF**



# Mr. Barry Kashambo

## Regional Director

ICAO – ESAF



**Ms. Boni Dibate**

**Director Africa Affairs**

**CANSO**



# Thank you

Visit us:  
**canso.org**

