CORUS five

Conflict Management & Demand Capacity Balancing In the short term

Andrew Hately & Abinaya Kannan

CORUS five third workshop, 27th March, 2026

sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

DCB & CM in U-space

CORUS five

- Demand Capacity Balancing
- Conflict Management
- Conclusions

sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

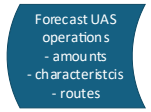
CORUS five

Demand Capacity Balancing
In the short term

CORUS five has received funding from the European Union under grant agreement 1011166763

DCB: Creating a U-space Airspace

CORUS five



DCB: Creating a U-space Airspace

CORUS five

DCB: Creating a U-space Airspace

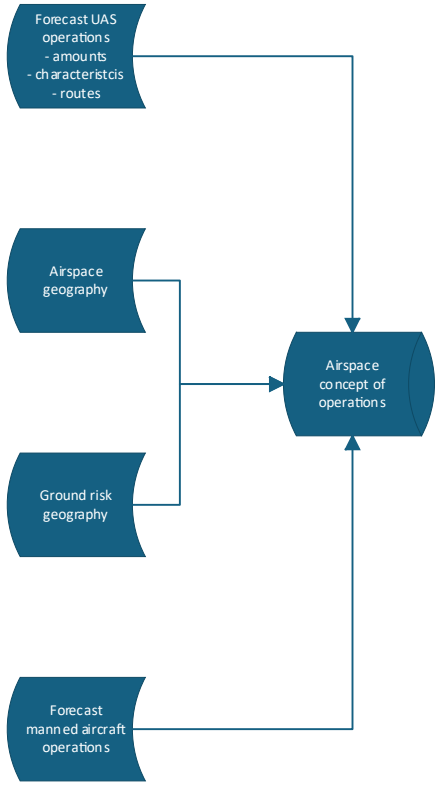
CORUS five

DCB: Creating a U-space Airspace

CORUS five

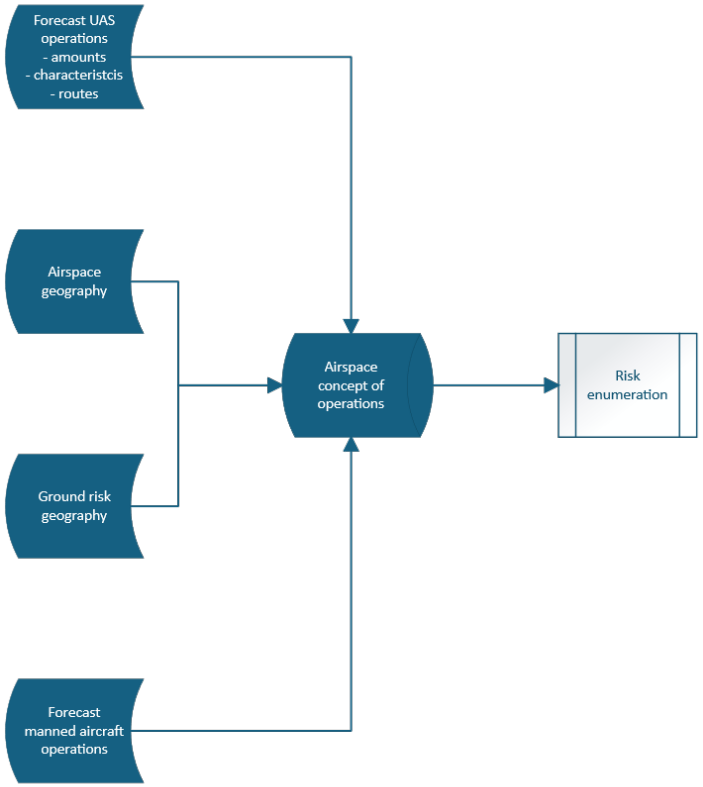
DCB: Creating a U-space Airspace

CORUS five



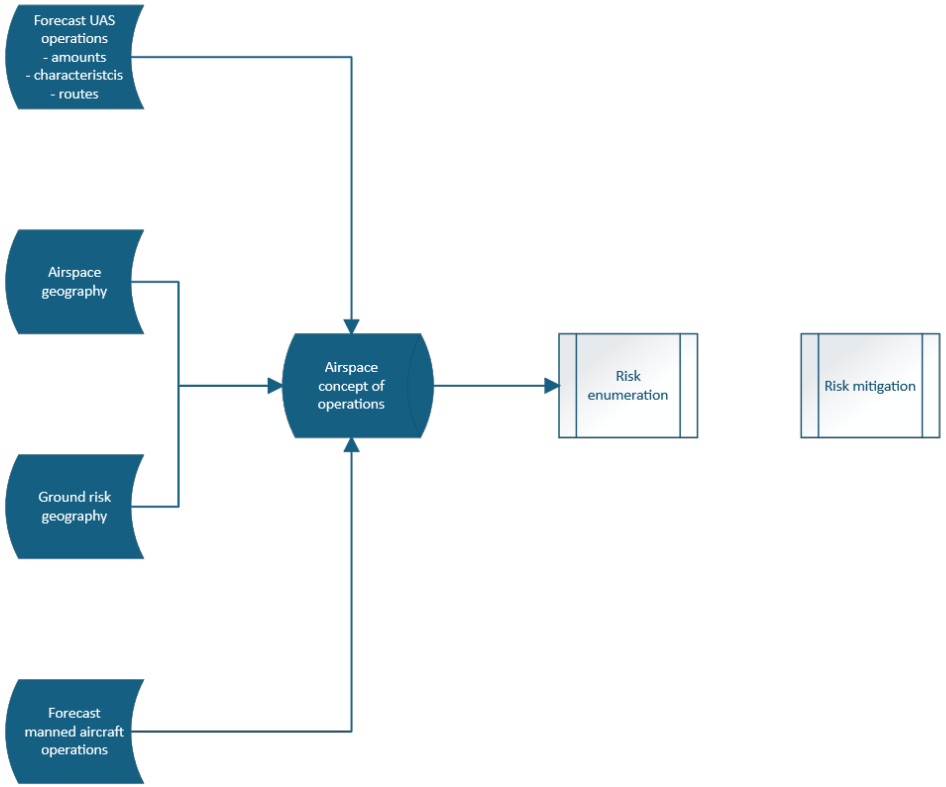
DCB: Creating a U-space Airspace

CORUS five



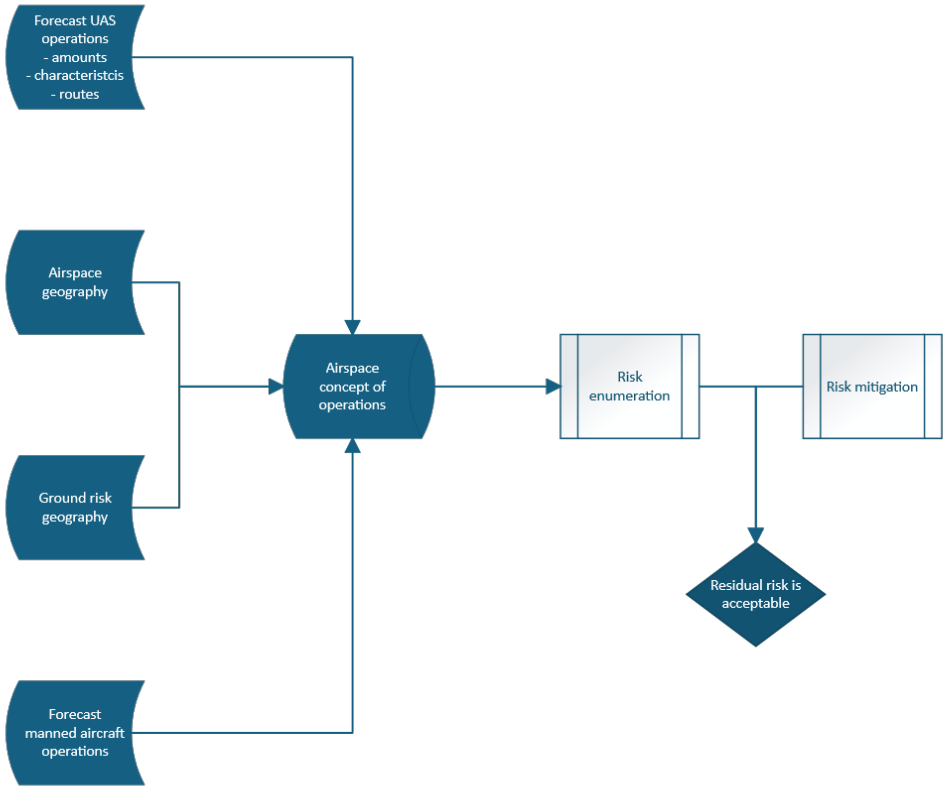
DCB: Creating a U-space Airspace

CORUS five



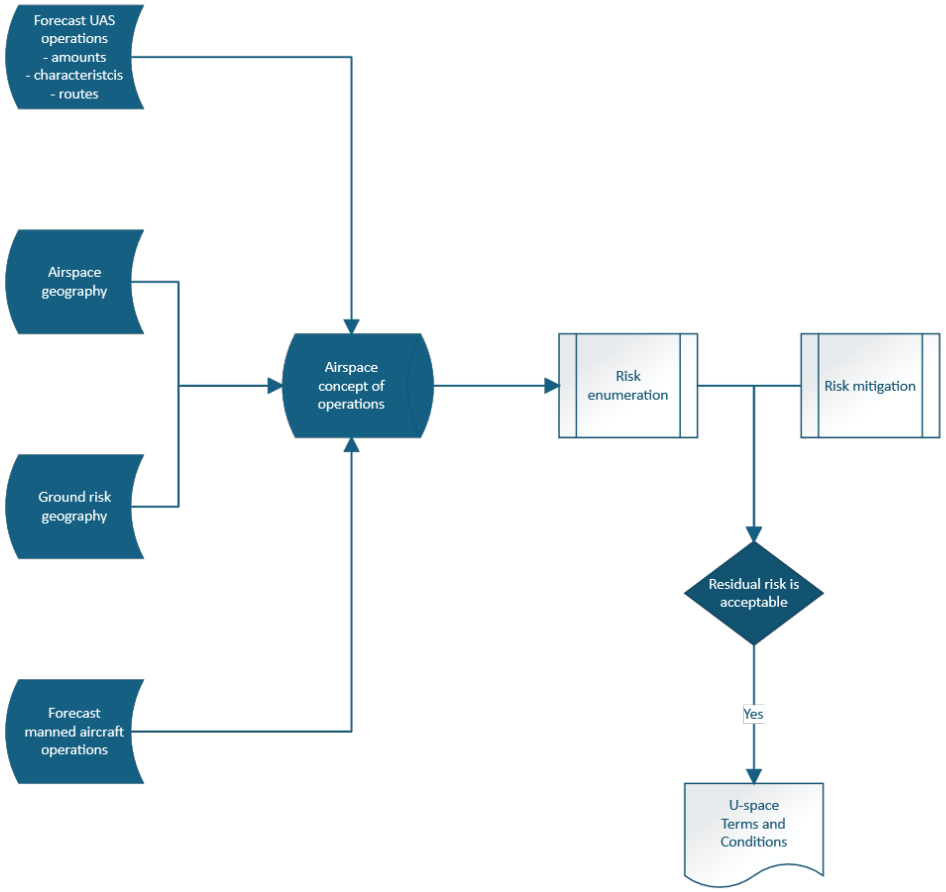
DCB: Creating a U-space Airspace

CORUS five



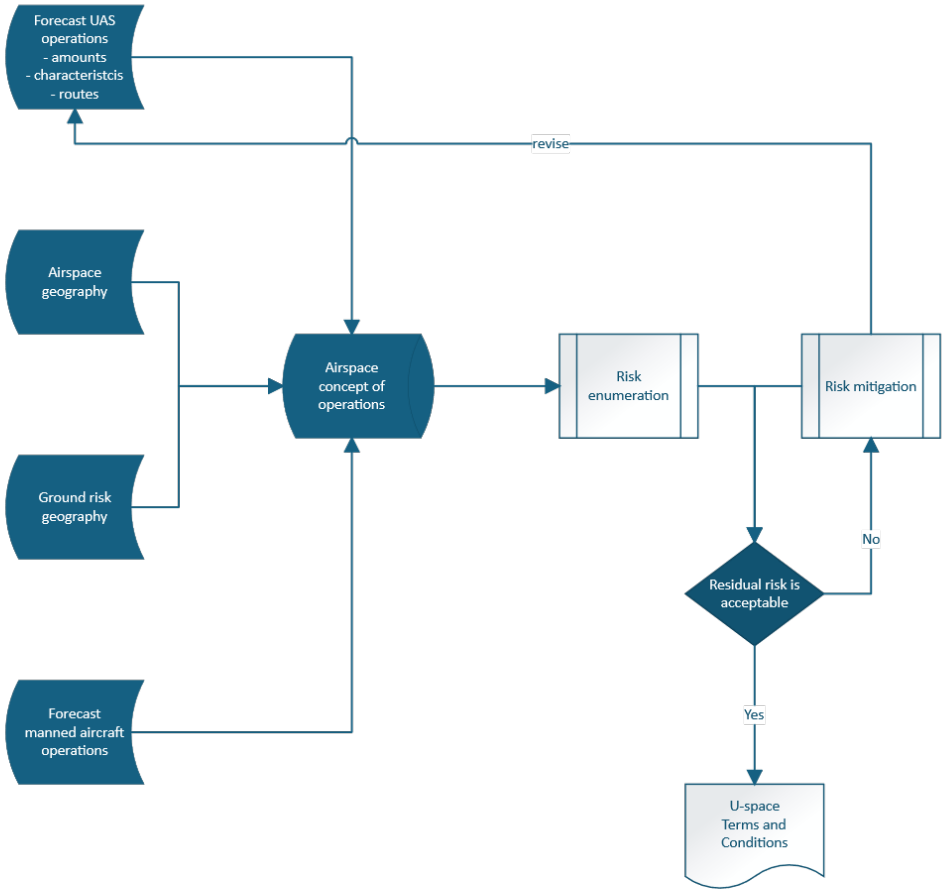
DCB: Creating a U-space Airspace

CORUS five



DCB: Creating a U-space Airspace

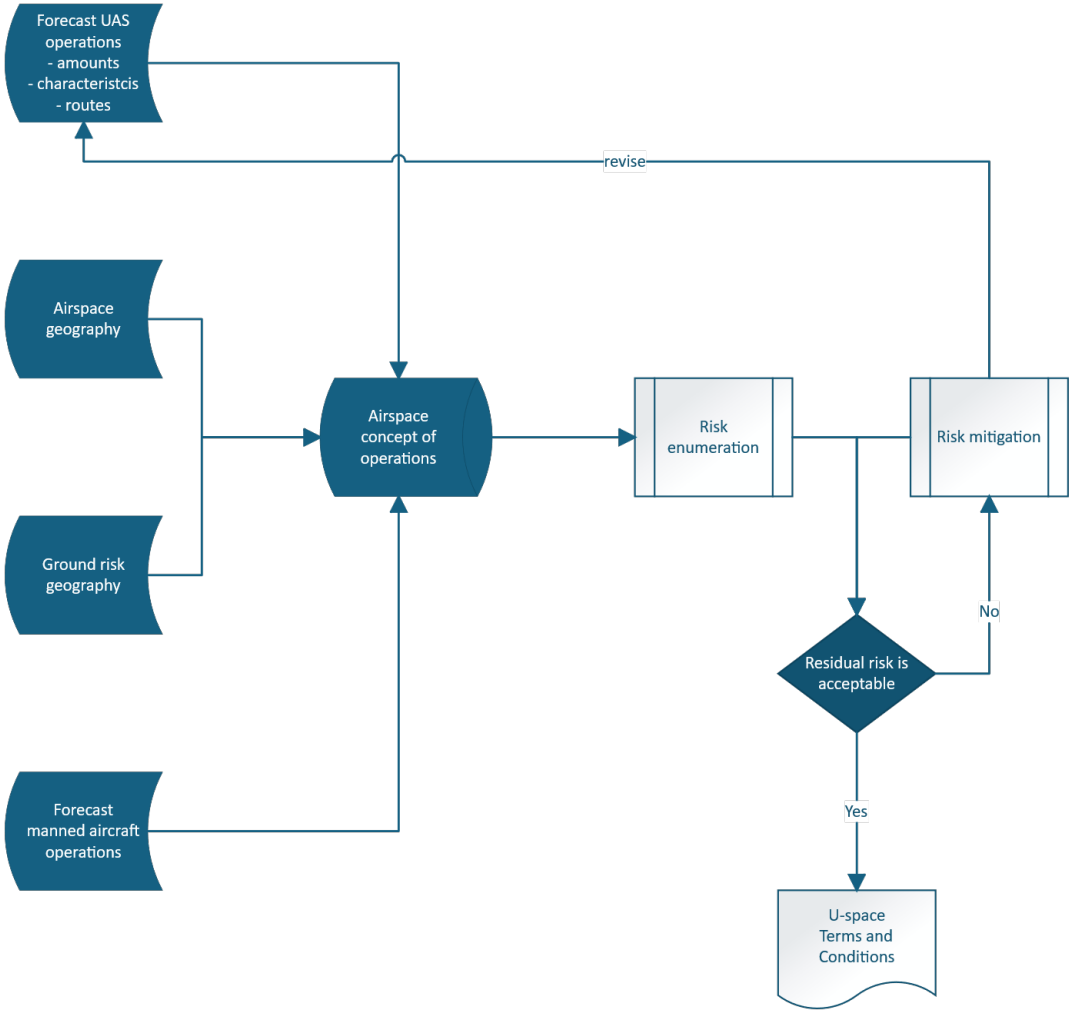
CORUS five



DCB: Capacity in U-space

- U-space airspace is created based on an assessment of the risks of a concept of operation
  - UAS Traffic level
  - UAS Traffic characteristics
  - Existing risks – manned traffic, ground risk
  - Risk mitigations

- For each U-space airspace there is a safe level of traffic



DCB in the U-space regulations

CORUS five

- EU IR 2021/664, Article 10 (2)(a)
  - check if the UAS flight authorisation request is complete and **correct** and submitted in accordance with Annex IV;
- EU IR 2021/664, Article 10 (7)
  - U-space service providers shall check the request for UAS flight authorisations against **U-space airspace restrictions** and temporary airspace limitations.
- AMC1 Article 10(2)(a)
  - …only accept the UAS flight authorisation request when…(b) The maximum capacity and density of UAS flights in the U-space airspace (AMC1 to Article 3(4) of Regulation (EU) 2021/664) is not yet reached.

DCB process – short term

CORUS five

- Intention:
  - The capacity expresses a safety limit
  - It comes from a risk assessment
- Theory:
  - Flights are accepted until the capacity is reached.
  - After that flights are not accepted.
- Practical questions:
  - How is capacity expressed / calculated ?
    - Number of flights in the whole airspace?
    - Density of flights in any one region?
  - How do multiple USSP collectively apply this limit ?

DCB – the short term

- A practical process is needed
  - To be developed considering risk to be mitigated
  - Allowing a federation of USSP to operate simultaneously
- AMC revision is needed

sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

DCB example

Nominal form

- Flight Authorisation Request arrives
- USSP calculates total demand and compares with capacity
- Capacity is exceeded
- Flight Authorisation Request is rejected

Other form

- Flight Authorisation Request for a priority flight arrives
- USSP calculates total demand and compares with capacity
- Capacity is exceeded
- *Then what*?

sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

DCB example

Nominal form

- Flight Authorisation Request arrives
- USSP calculates total demand and compares with capacity
- Capacity is exceeded
- Flight Authorisation Request is rejected

Other form

- Flight Authorisation Request for a priority flight arrives
- USSP calculates total demand and compares with capacity
- Capacity is exceeded
- Withdraw the authorisation from the most recently authorised non-priority flight
  - EU IR 2021/664 Article 10(9) …on a first come first served basis.

Further considerations for DCB

CORUS five

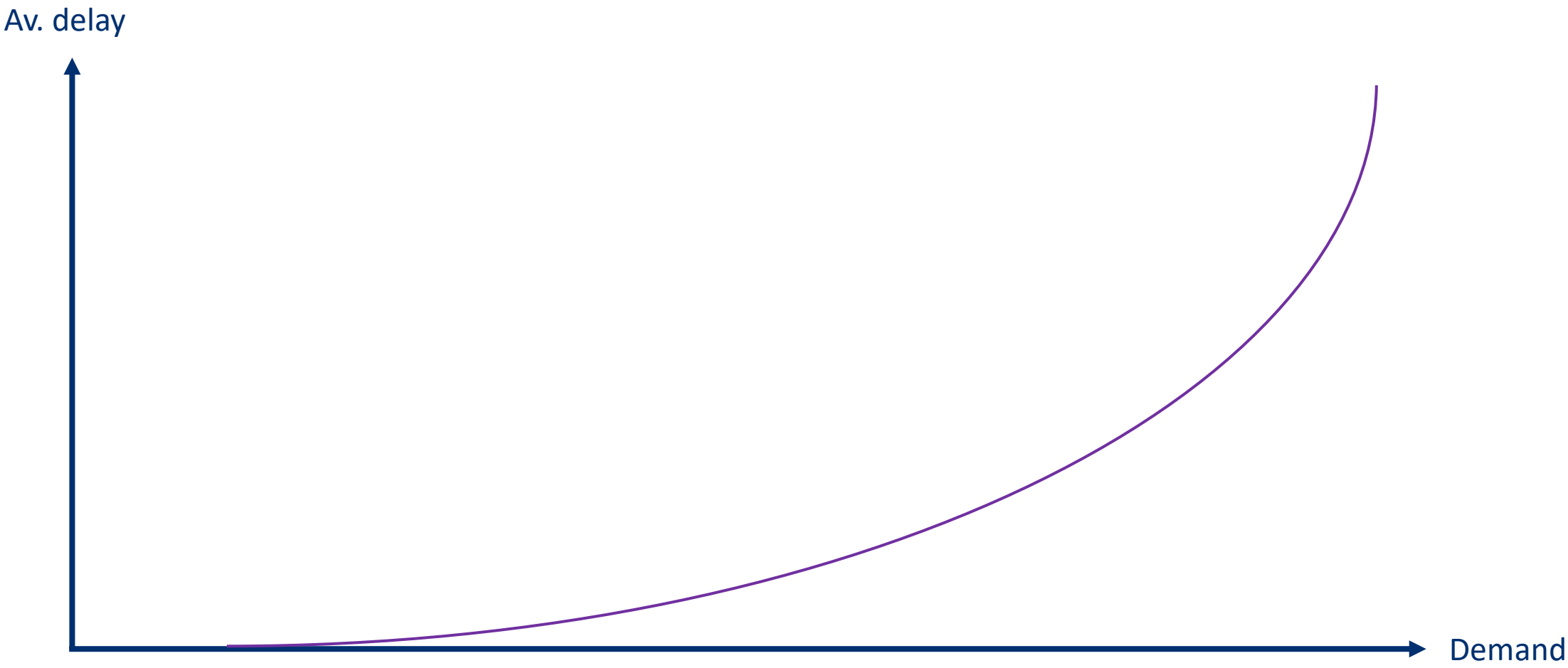
- If flight authorisations (demand) are rejected when capacity is exceeded
- Many operators will resubmit their request.
  - Some will reroute
  - For many the change will be take off time
- Hence, as in manned aviation, the result of capacity exceeding demand is delay

- At what level should capacity be set?

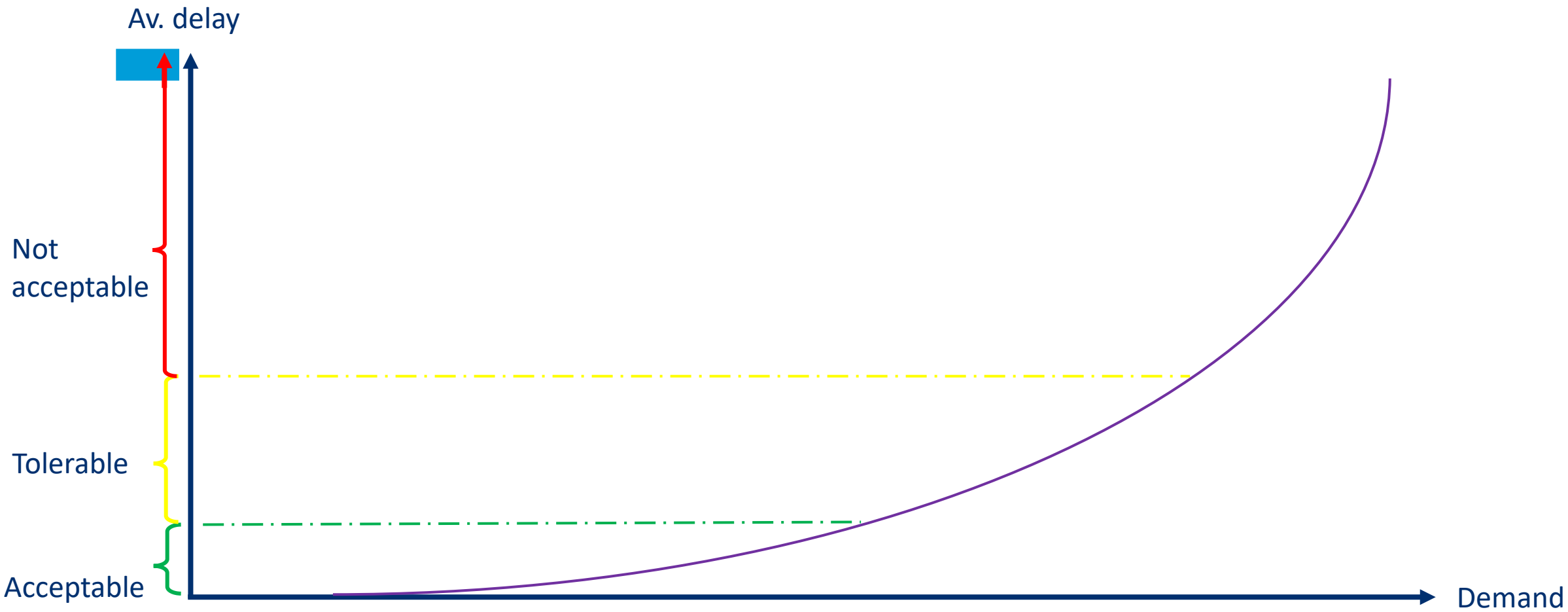
Demand vs average delay

sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

Exponential increase

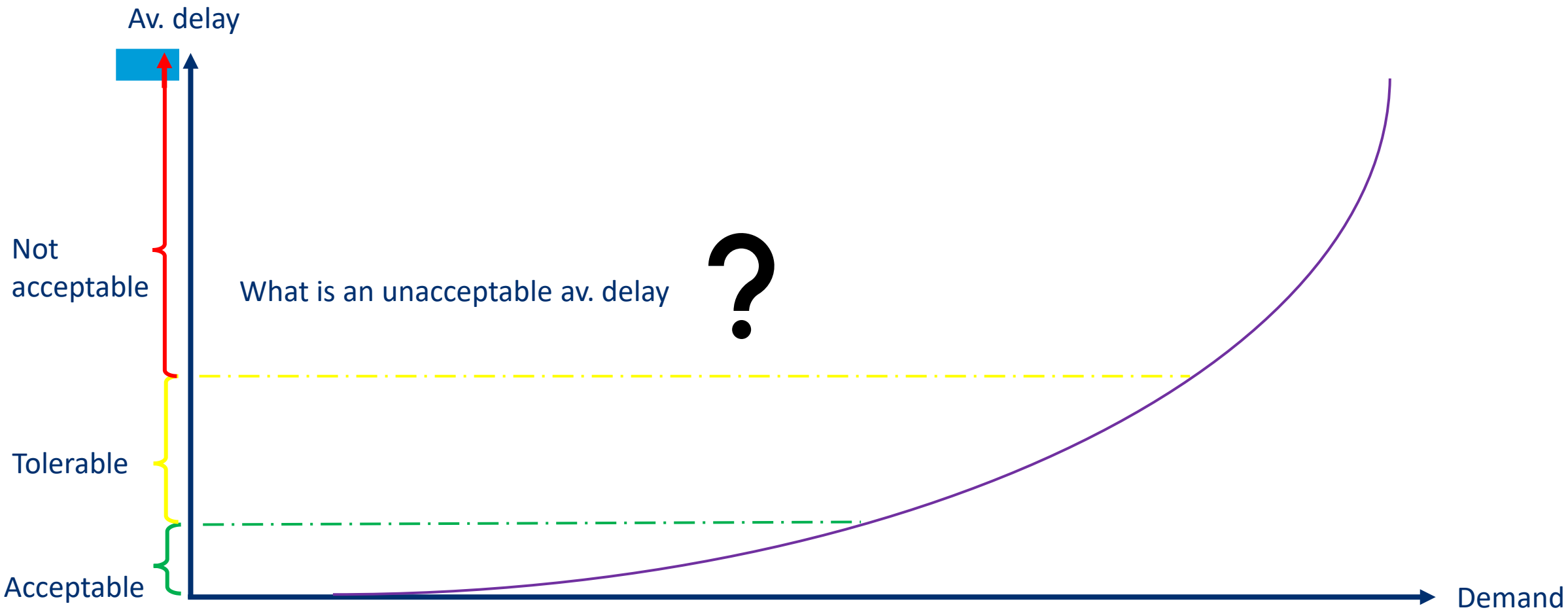


‘Traffic light’ scheme

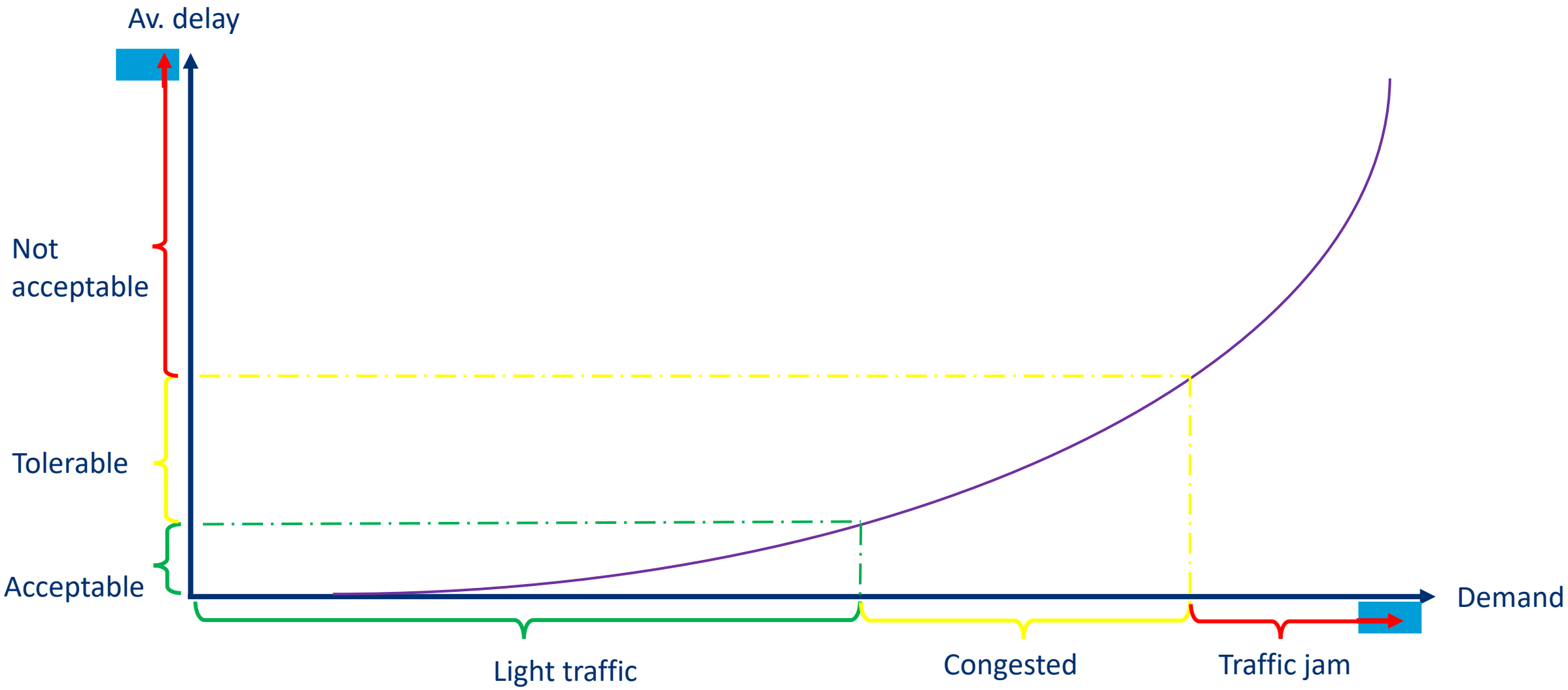


sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

‘Traffic light’ scheme



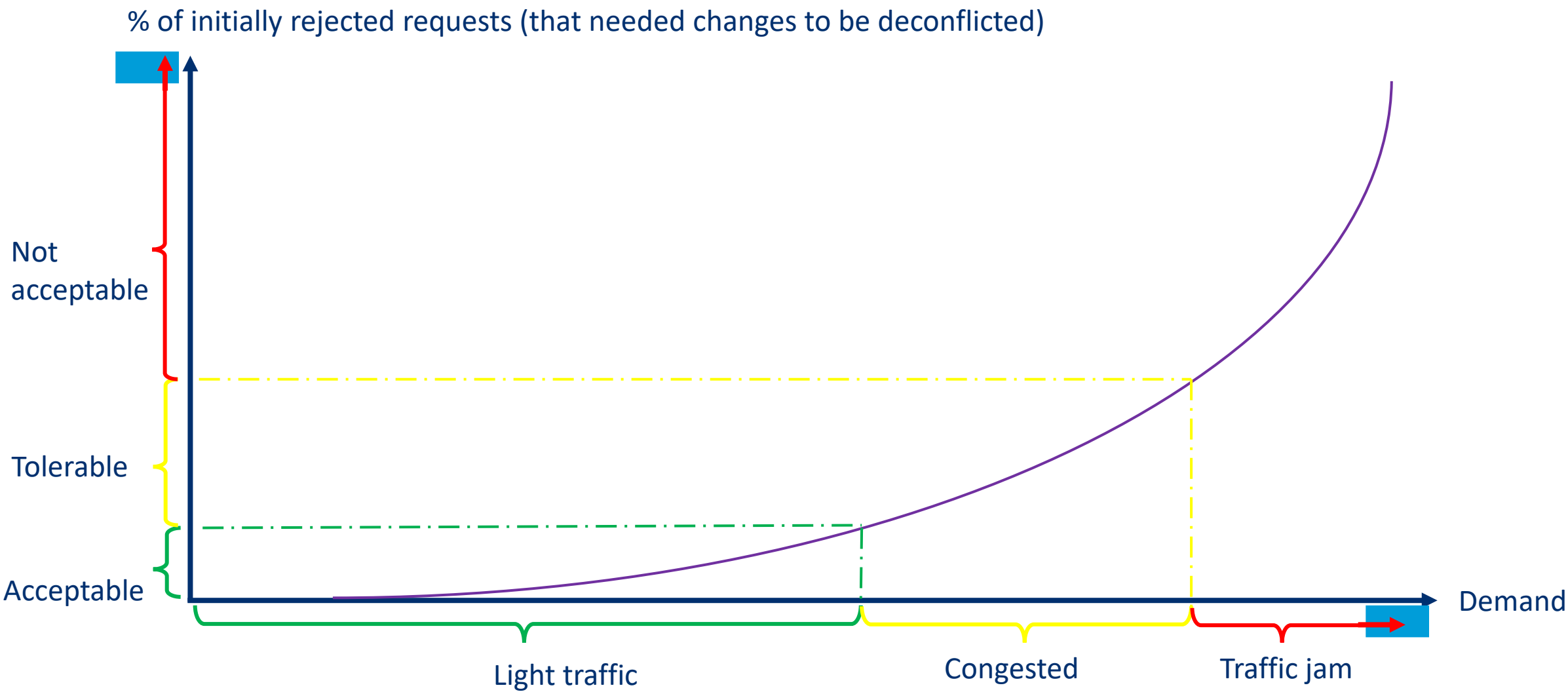
Three demand regions



sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

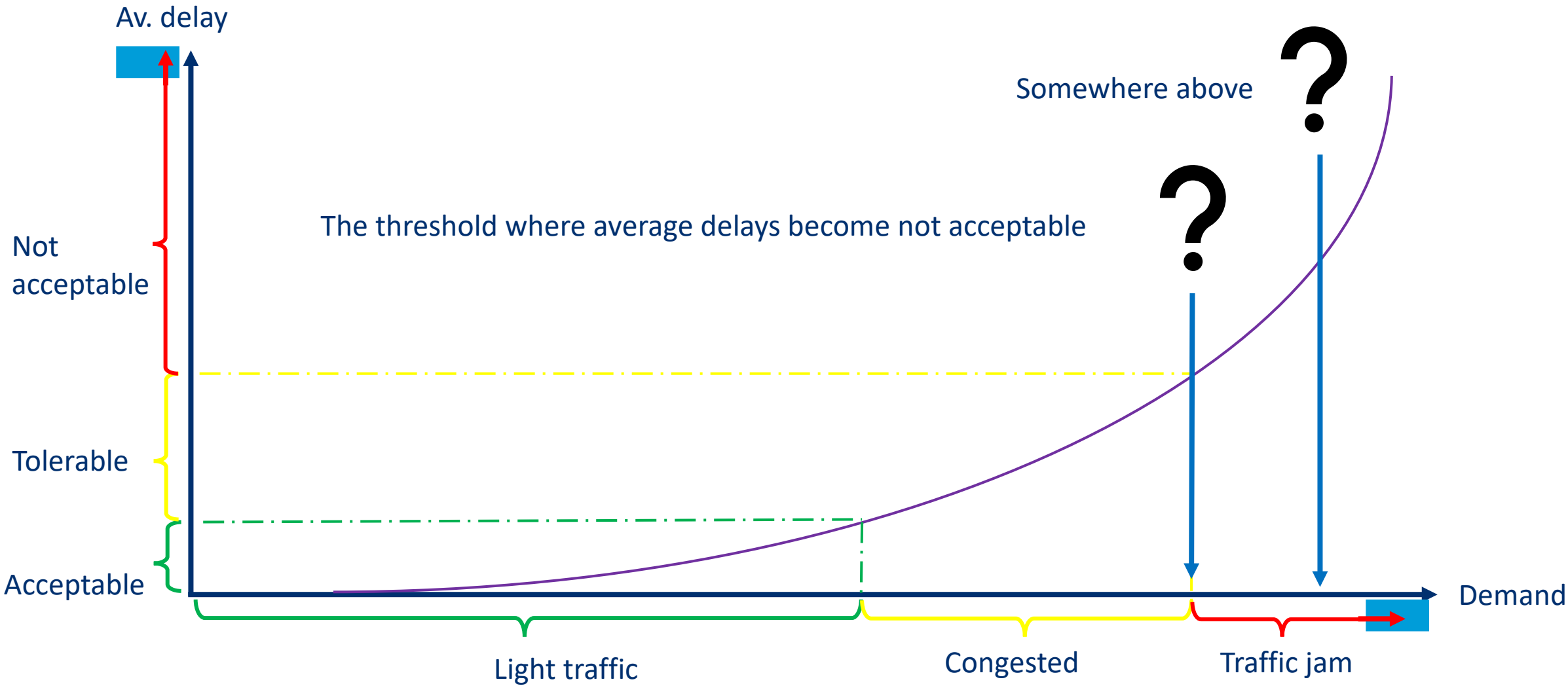
Also possible with % of rejected UAS flight authorisation requests

CORUS five

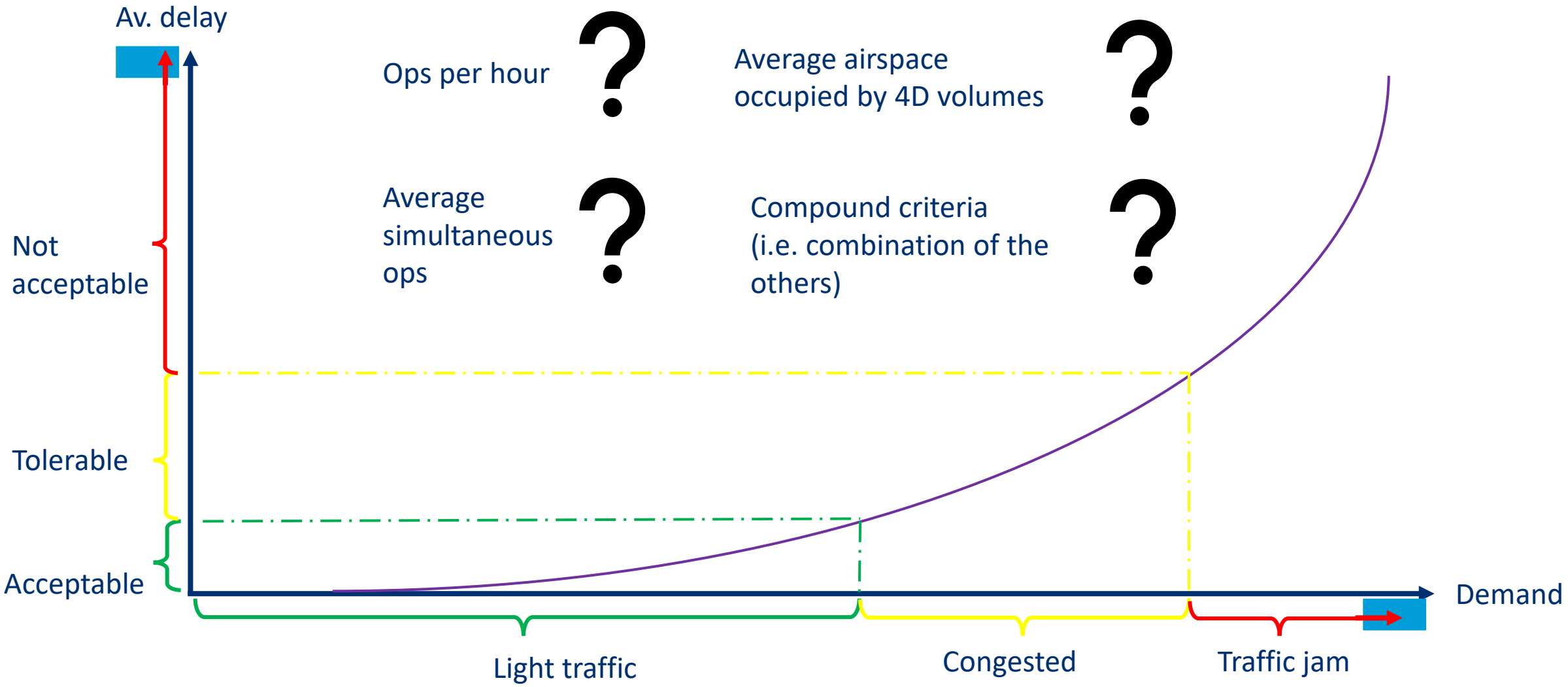


But what is the capacity of the U-space airspace?

CORUS five



And how do we express demand?



CORUS five

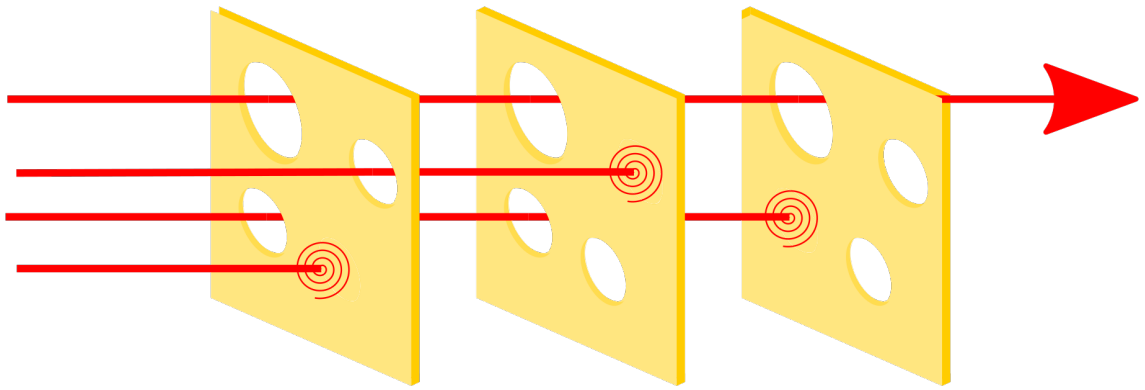
Conflict Management
In the short term

CORUS five has received funding from the European Union under grant agreement 101166763

The “swiss cheese” model of aviation safety

CORUS five

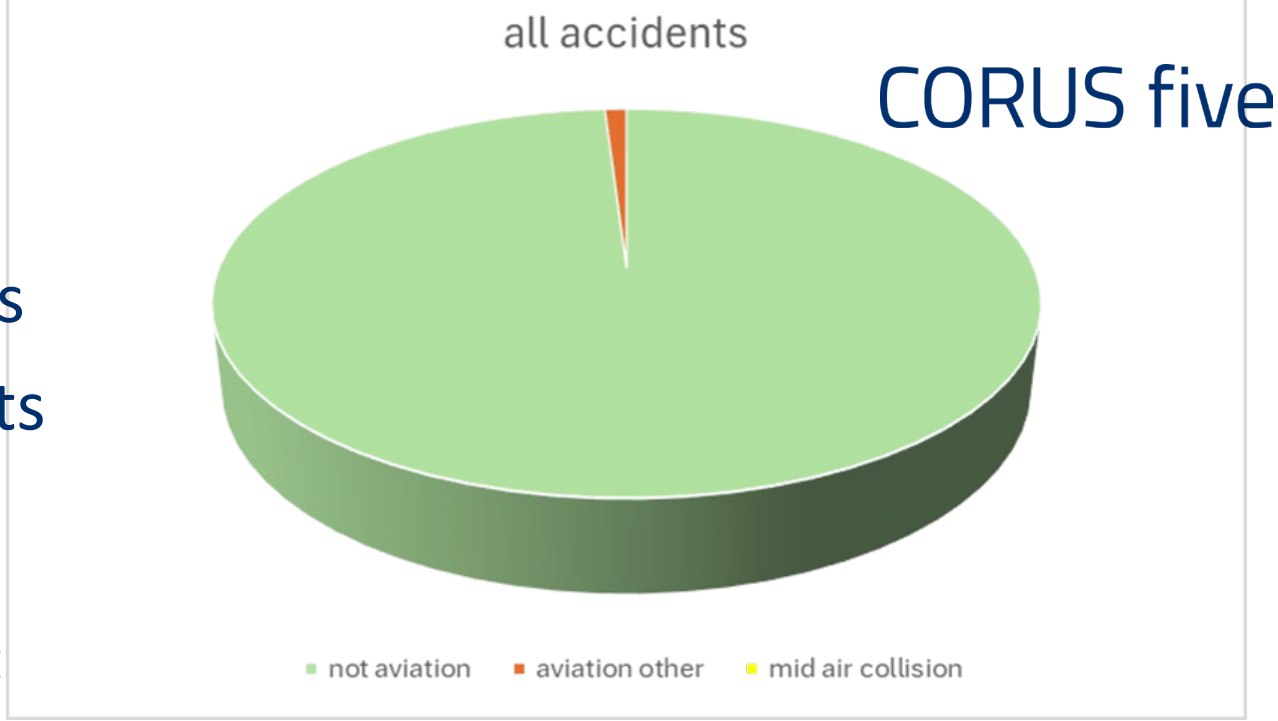
- Strategic
  - Airspace structure
  - Demand Capacity Balancing
  - Preflight deconfliction - if any
- Tactical
  - Separation
    - Pilot: VFR
    - Service: IFR in controlled airspace
- Collision avoidance
  - E.g. ACAS
- Providence
  - “big sky theory” = *the sky is big and UAS are small*



sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

Safety

CORUS five

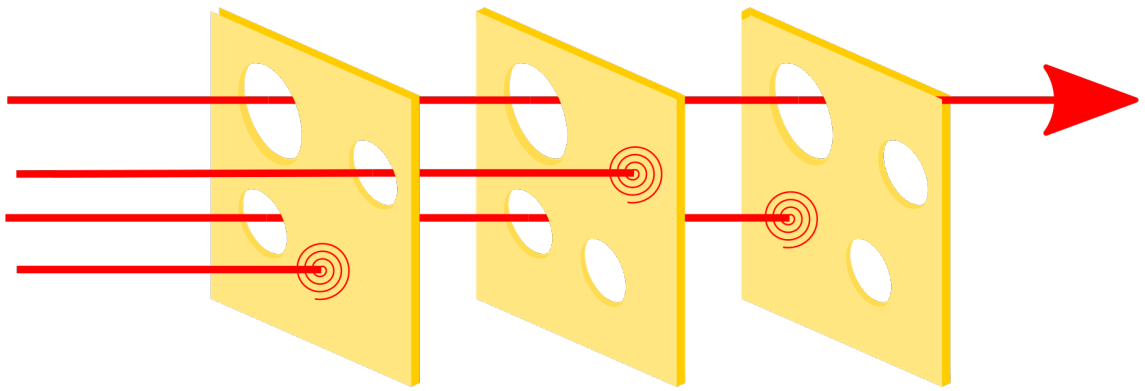


- Our metric is injury or death of humans
- There are multiple reasons for accidents
  - Non aviation
  - Aviation but not due to collision
  - Mid air collision with conspicuous aircraft
- Society (the regulator) determines the acceptable rate of each = Target Level of Safety
- Each layer (of cheese) reduces the risk of conflict
  - The effectiveness expressed as the *risk ratio*
  - $rr = \frac{mitigated\ probability}{unmitigated\ probability}$

U-space short term

CORUS five

- Strategic
  - Airspace structure
  - Demand Capacity Balancing
  - Preflight deconfliction
- Tactical
  - Separation
    - Remote Pilot by reference to Traffic Information
- Collision avoidance
  - none
- Providence
- System Performance is not equal to safety
  - Not every falling UAS hits someone



sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

Safety, efficiency, separation, capacity, cost

CORUS five

- Airspace is a finite resource
- We want to make use of it optimally while not causing an unacceptable level of accidents
  - Respect the target level of safety
- The way each slice of cheese is implemented determines its risk ratio.
- In many layers, allowing more space/time“margin” enables
  - smaller risk ratio

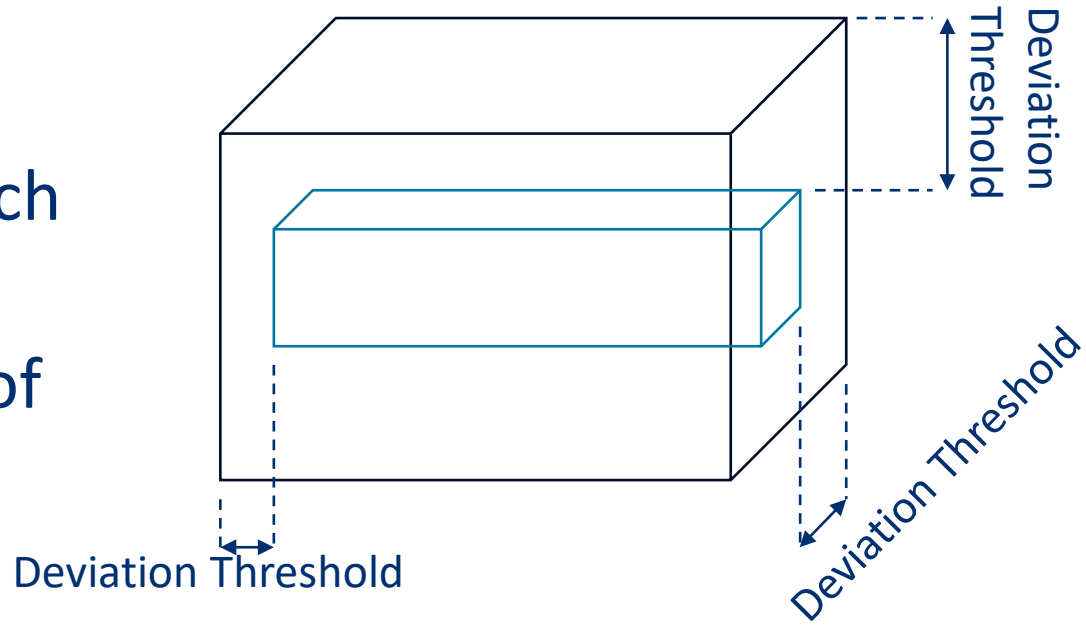
  Or
  - Less precise flight = flight optimised for some other goal, e.g. battery life, low cost

sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

Strategic Deconfliction in U-space

CORUS five

- The UAS Operator makes a flight authorisation request – including a series of 4D volumes the flight will occupy.
- The 4D volumes express 95% confidence
- The USSP adds Deviation Threshold in each dimension
- Strategic deconfliction tests for absence of intersection of the enlarged volume
- Intersecting flights are not authorised
  - Priority is considered, then request time



Tactical conflict management in U-space

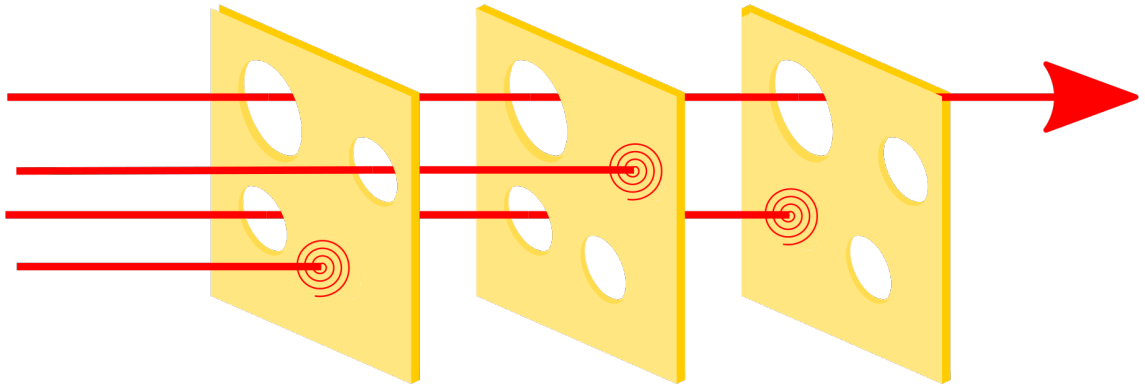
CORUS five

- The remote pilot is responsible to “take the relevant action to avoid any collision hazard.”
  - EU IR 2021/664 Article 11(4)
- The remote pilot is informed by Traffic Information and Common Information.
- Traffic Information includes
  - UAS
  - Any (e.g. manned) aircraft conspicuous to (any) USSP
    - EU IR 2021/664 Article 11(1)
- Common information includes Traffic information from ATC
    - EU IR 2021/665 Article 1(2)(a)
  - This should be delivered as part of the Traffic Information Service

U-space short term

CORUS five

- Strategic
  - Airspace structure
  - Demand Capacity Balancing
  - Preflight deconfliction
- Tactical
  - Separation
    - Pilot by reference to Traffic Information
- Collision avoidance
  - Not mandated
- Providence
- System Performance is not equal to safety
  - 1 in Y falling UAS hits someone
- Overall RR = 1/1000 * ¼ * 1 * 1/10 * 1/Y



Strategic	Tactical	CA	Providence
1/1000	1/4	1	1/10

Indicative numbers for UAS – UAS risk

sesar JOINT UNDERTAKING
Co-funded by the European Union
Co-funded by EUROCONTROL

U-space Conflict Management today

CORUS five

- Conspicuousness to USSP ➔ Electronic Conspicuity
  - ADSB
  - ADSL on SRD 860
  - ADSL on mobile network
  - *Safesky & similar GA networks*
  - *UAS hook on device but used by manned aviation*

  } *Not acceptable means of compliance today*
- Traffic Information: Traffic *in proximity* to the UAS
  - EU IR 2021/664 Article 11(1)
  - *in proximity* defined in ARA process as one minute away
- Conformance Monitoring
  - Other UAS operators will be alerted of other UAS that have exited their authorised volume.
    - Augmentation of traffic information

CORUS five

THANK YOU
FOR YOUR ATTENTION