Introduction

Presented by

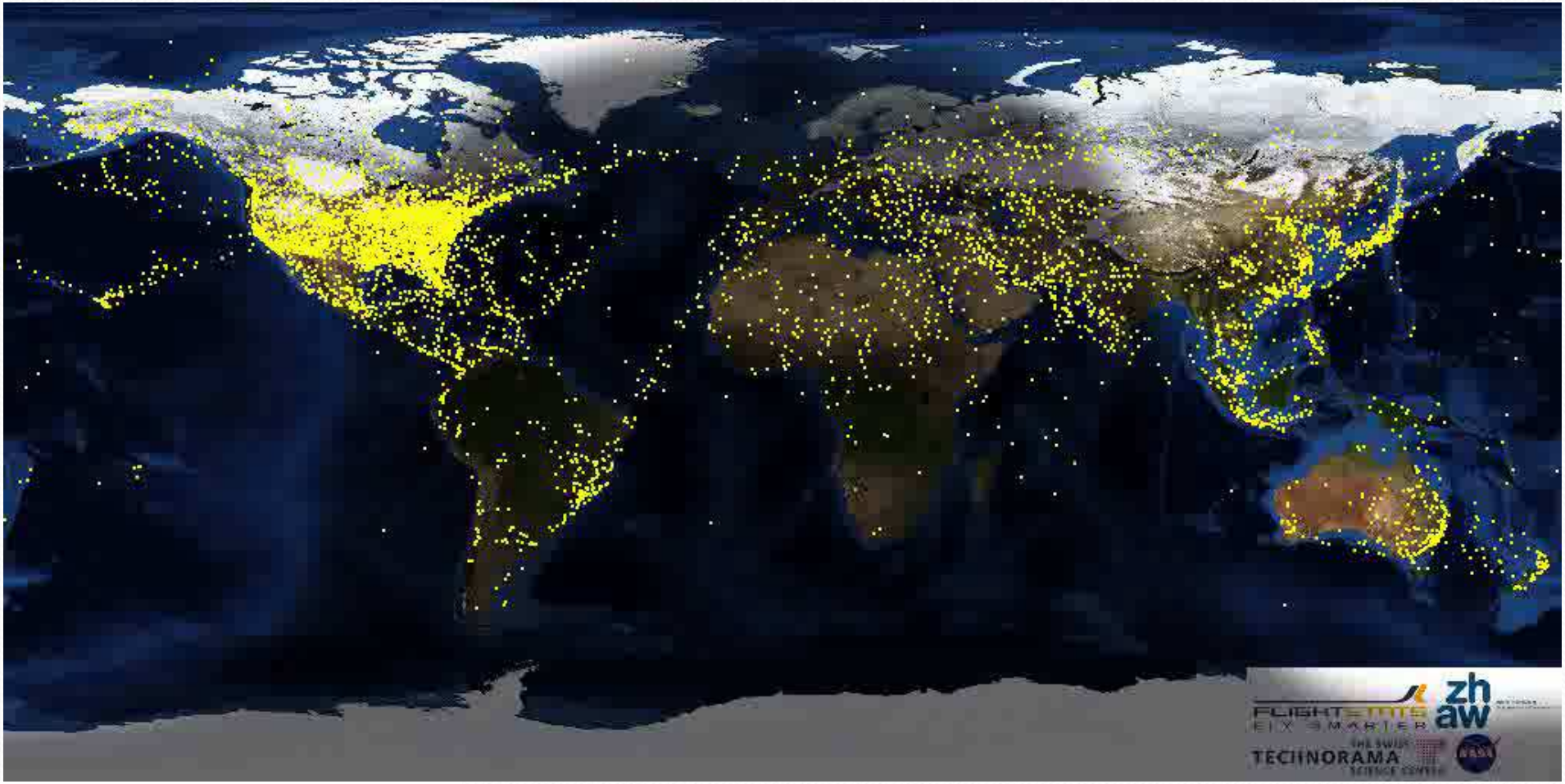
Na TAO

ALTRAN on behalf of ENAC

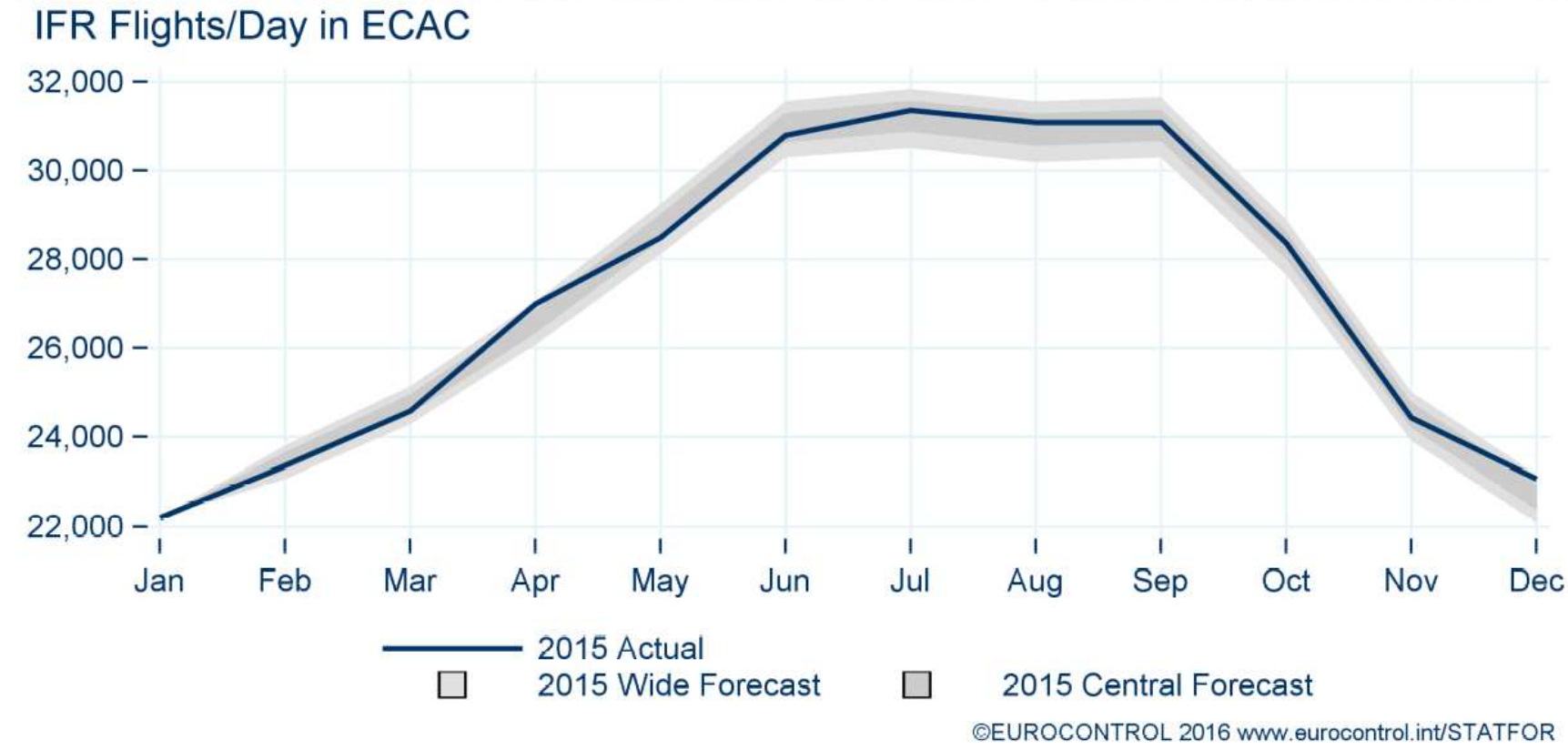
Outlines

- State of the aeronautical traffic
- A complex answer
- Place of the COM
- The RCP

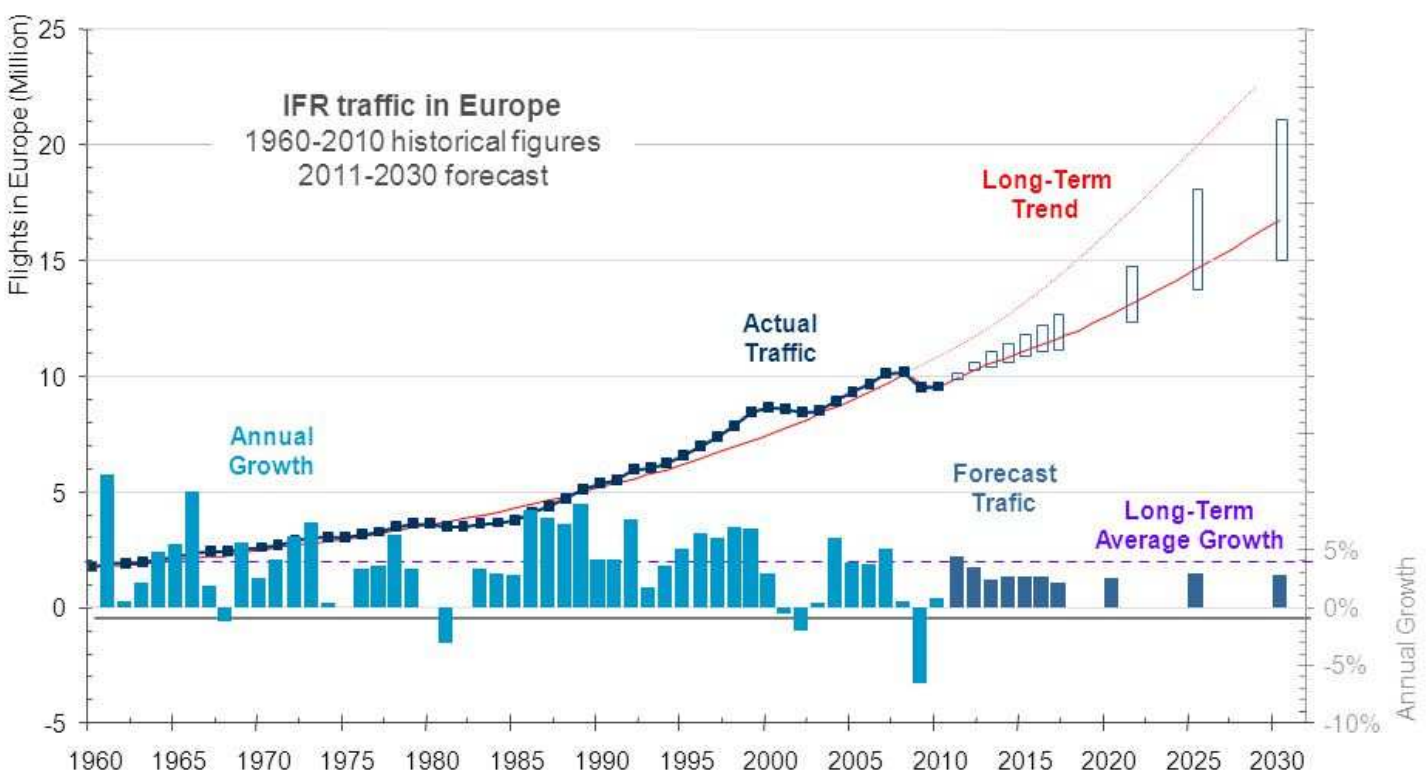
World wide aeronautical traffic



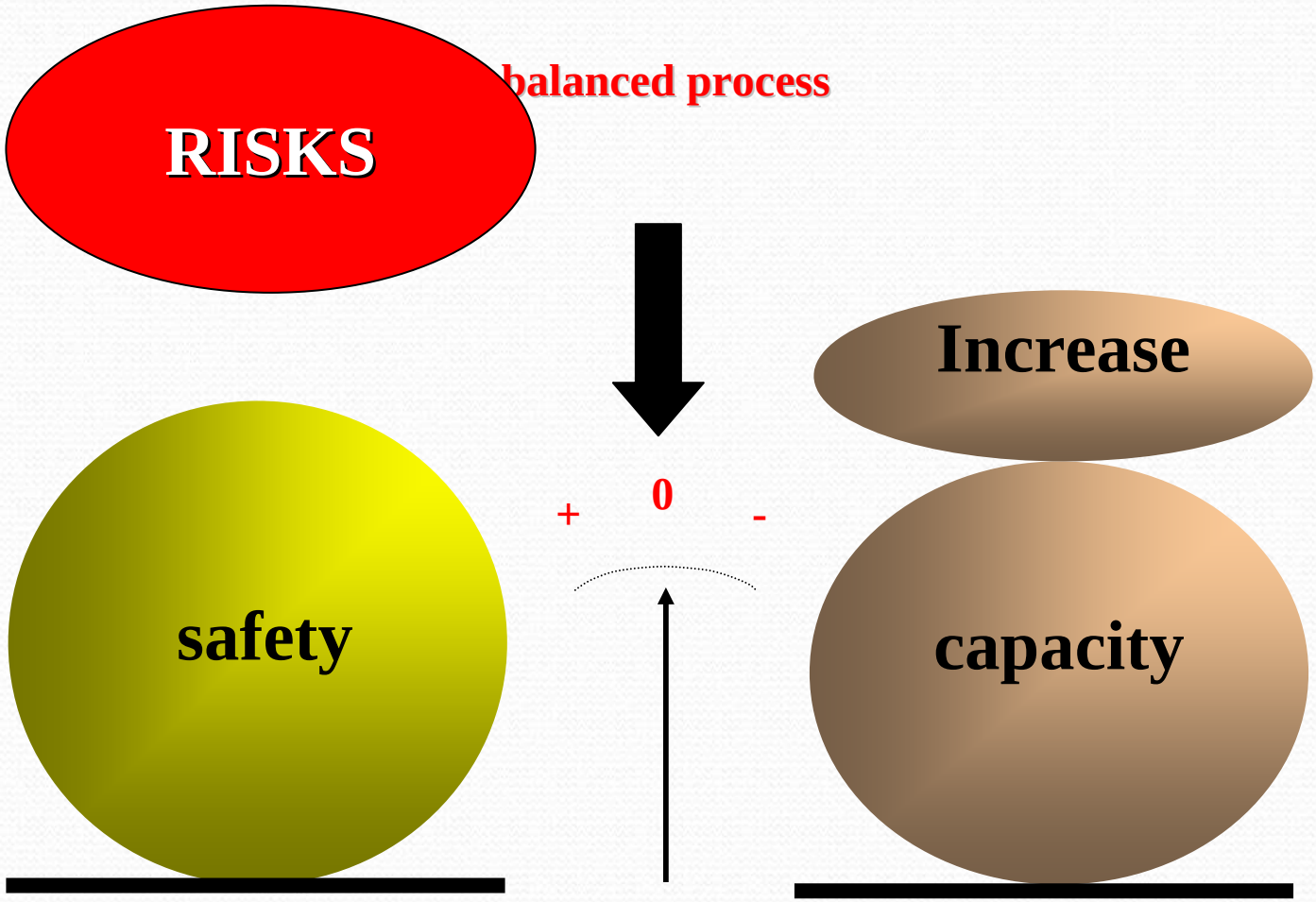
Daily traffic (Europe)



Traffic growth forecast (Europe)



The safety balance



The challenge of the safety

- High sensitivity area
  - Lots of people may be injured
- Need to increase the safety level
  - Complex process
  - Cost shall be under control
- Risk shall be defined

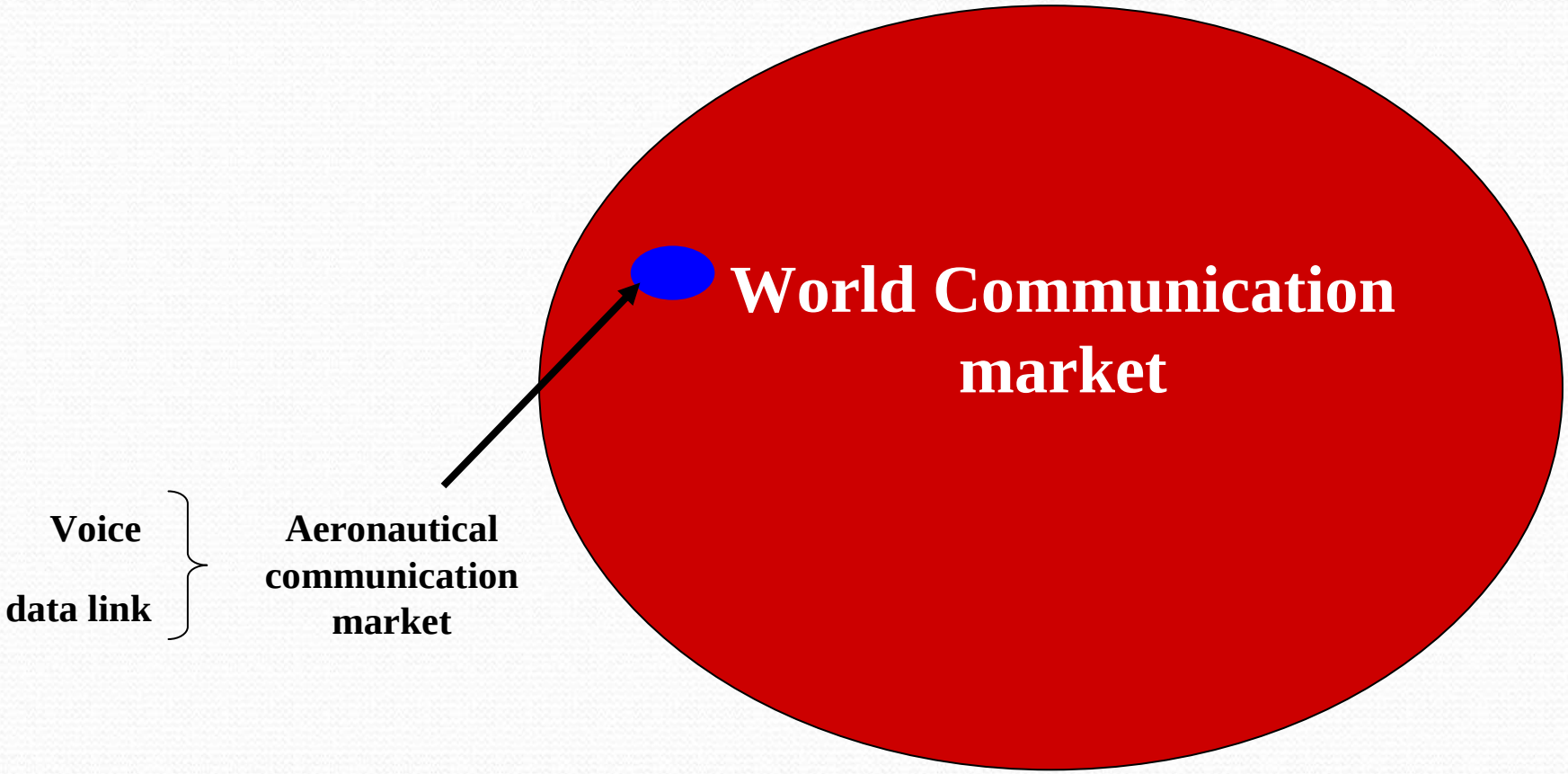
International constraints

- Mainly on the frequency band
- But also with the institutions…

Spectrum allocation

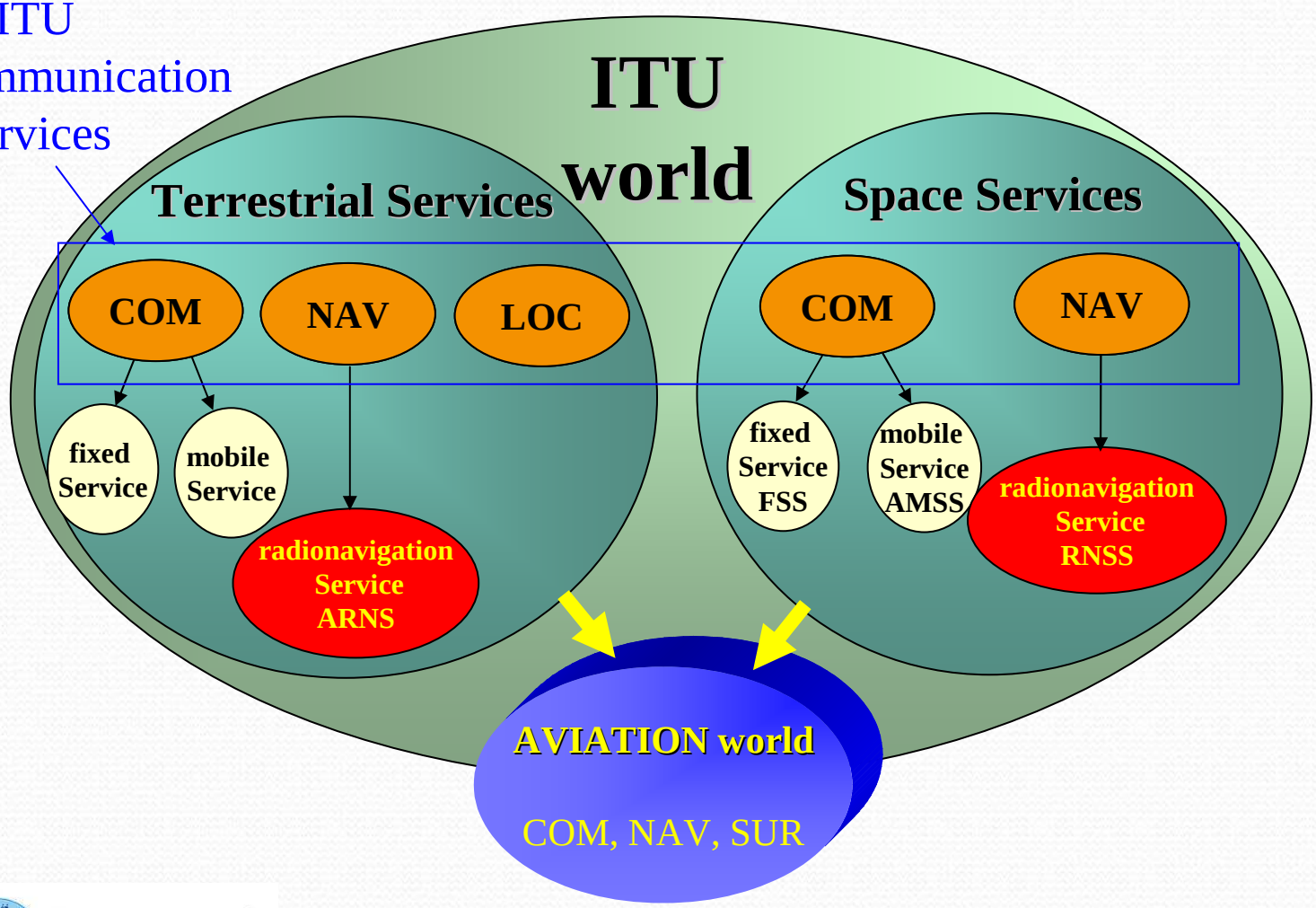
- One regulator : ITU
  - Spectrum allocation for services
  - Sharing rules
  - Keep up to date the world wide data base frequencies allocations
  - Hold the WRC (Worldwide Radio Conference)
- For the aviation world : ICAO
  - For the aeronautical industry
  - Check the capacity of the allocated spectrum
  - Manage its band

A weakness position



Spectrum allocation

ITU radiocommunication services



Aeronautical Frequencies

Allocation exclusive

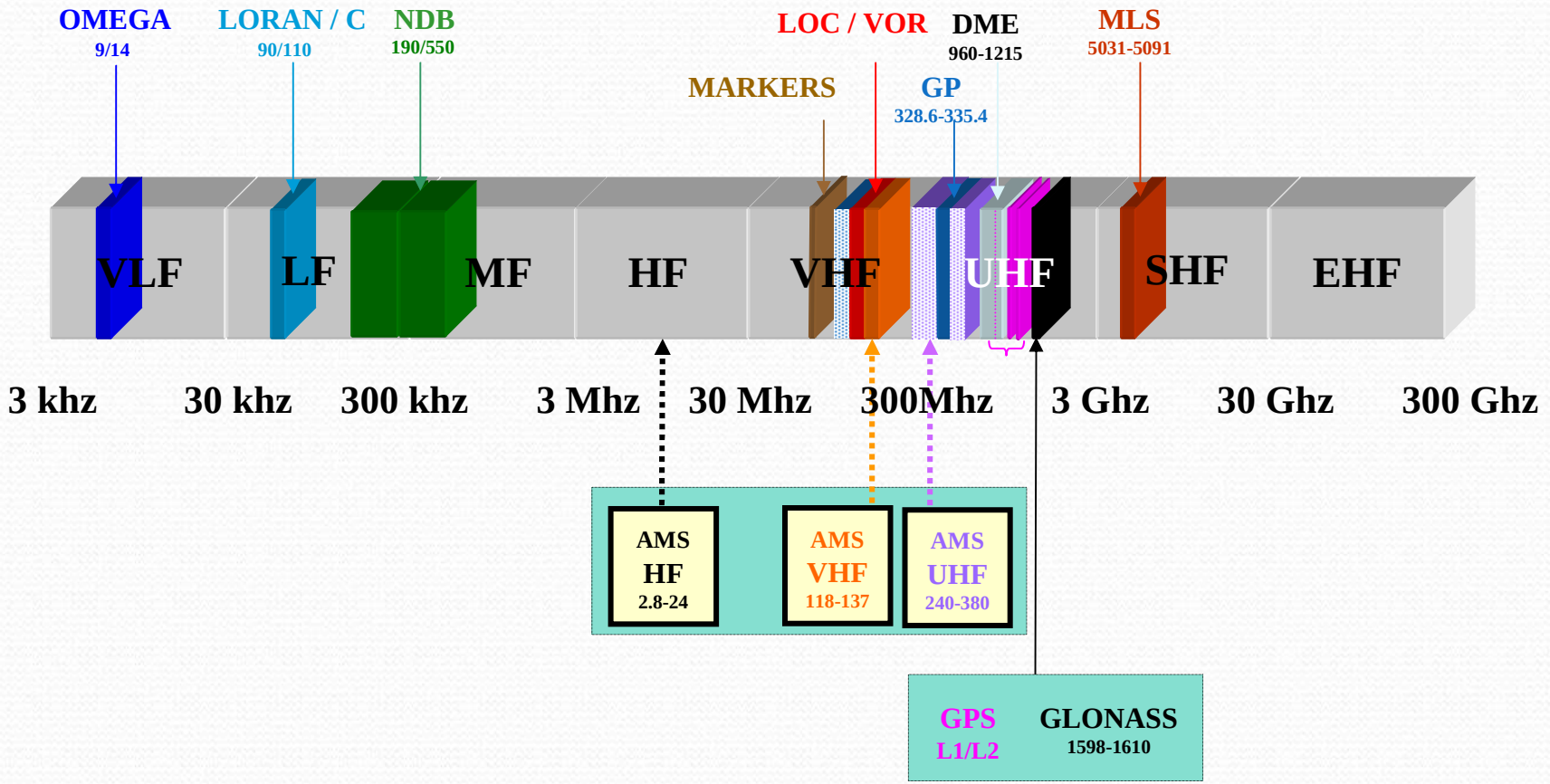
74.8 - 75.2 MHz	ILS (Marker beacons)
108 - 117.975 MHz	ILS (loc) + VOR
118 - 137 MHz	Air/ground Voice communications (mobile)
328 - 335 MHz	ILS (GP)
960 - 1215 MHz	DME TACAN + GNSS (secondary basis)
4200 - 4400 MHz	Radio-altimeter
5000 - 5150 MHz	MLS

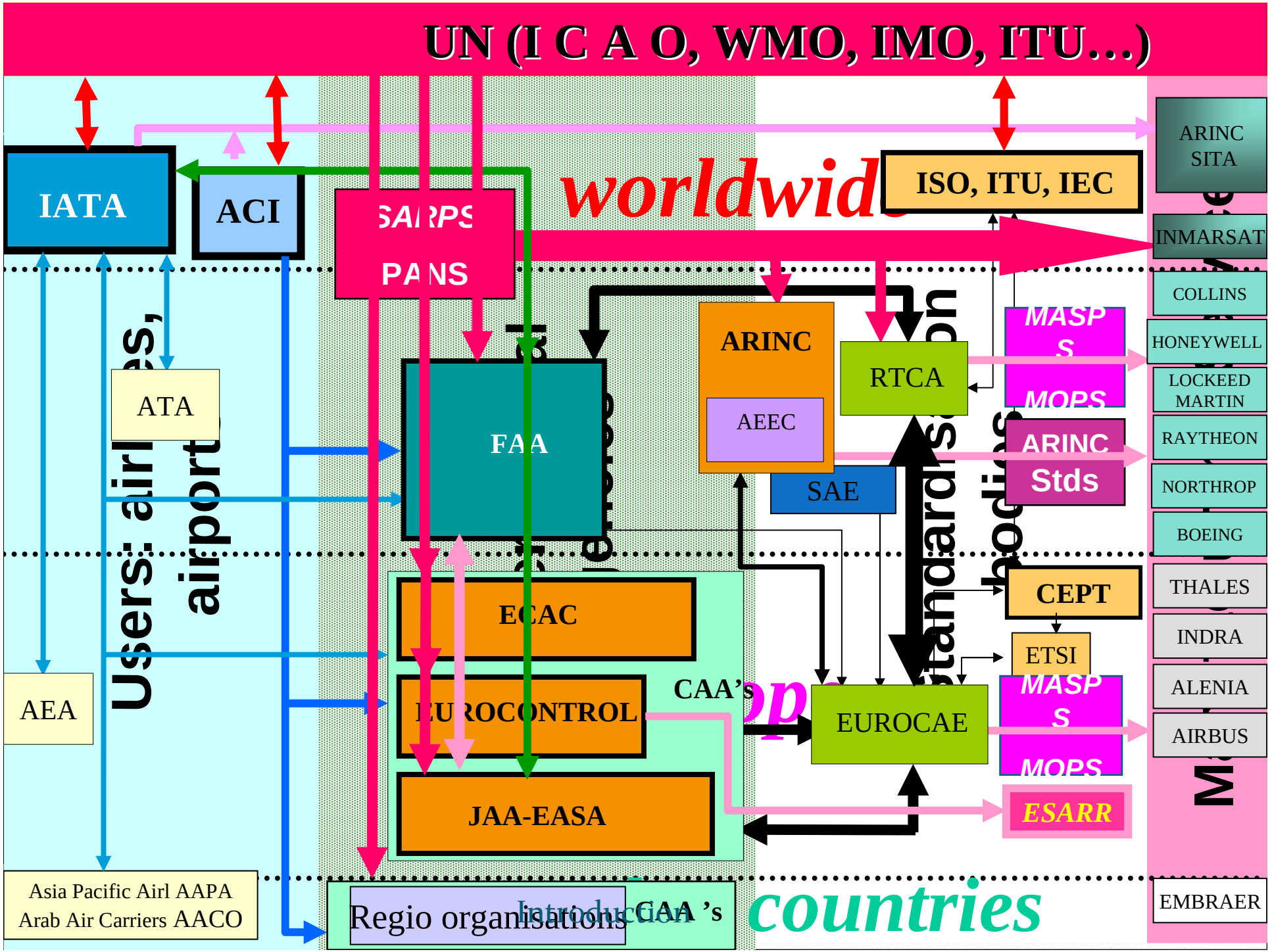
Aeronautical Frequencies

Allocation non exclusive

138 - 144 MHz	Military ATC air/ground communication
200 - 380 MHz	Military air/ground communication
1215 - 1350 MHz	Primary radar
1545 - 1559 MHz	Mobile satellite communication SV to G
1559 - 1613 MHz	GNSS (GPS + GLONASS)
1646 - 1656 MHz	Mobile satellite communication G to SV
2900 - 3400 MHz	Primary radar
5150 - 5250 MHz	MLS (long term)
5450 - 5470 MHz	On board radar

Aeronautical Frequencies

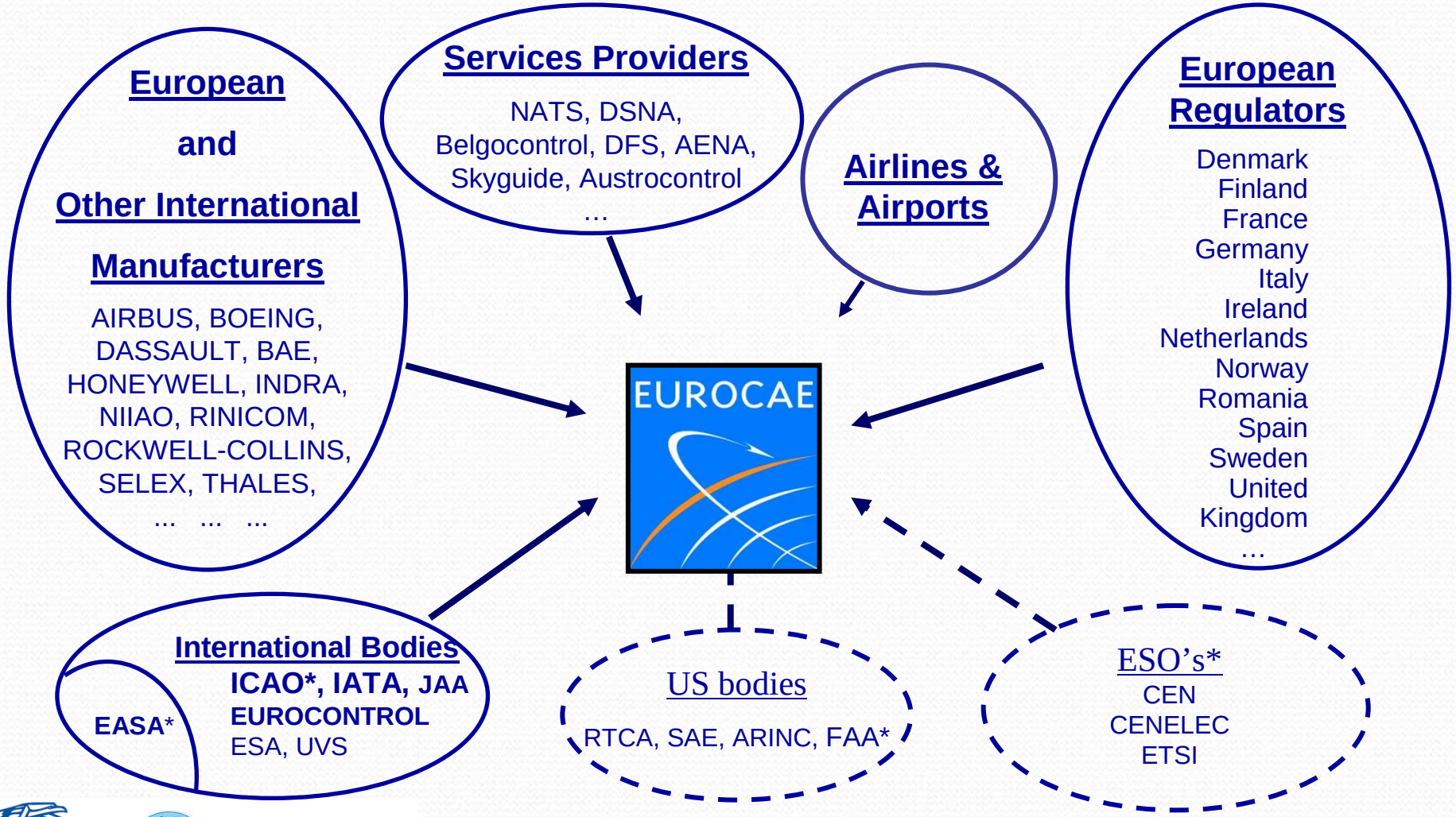



UN (I C A O, WMO, IMO, ...)
worldwide
IATA
ACI
SARPS
PANS
ISO, ITU, IEC
ARINC
SITA
INMARSAT
COLLINS
HONEYWELL
LOCKEED MARTIN
RAYTHEON
NORTHROP
BOEING
THALES
INDRA
ALENIA
AIRBUS
EMBRAER
ATA
FAA
ARINC
AEEC
SAE
RTCA
MASPS
MOPS
ARINC Stds
CEPT
ETSI
ECAC
EUROCONTROL
JAA-EASA
CAA's
EUROCAE
MASPS
MOPS
ESARR
AEA
Asia Pacific Airl AAPA
Arab Air Carriers AACO
Regio organisations
CAA 's
countries
Introduction

Exemple for the VDL2

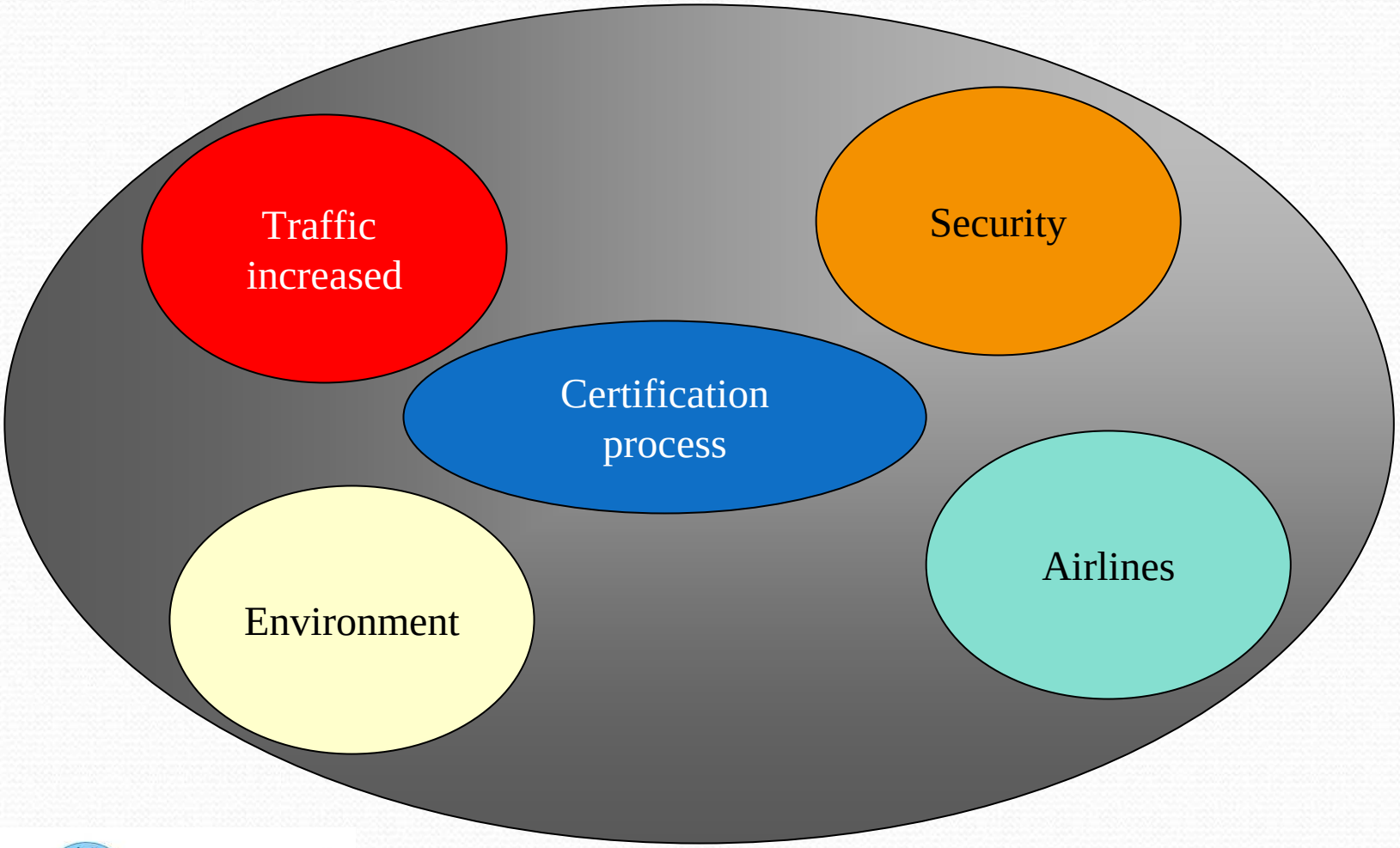
Org	Document Number	Document Title
ICAO	Annex 10	SARPs Aeronautical Communications
ICAO	9776	Manual of VHF Digital Link (VDL) Mode 2
RTCA	DO-224B	MASPS for VHF Digital Communications
RTCA	DO-281A	MOPS for Aircraft VDLM2 Physical, Link, and Network Layer
Eurocae	ED-92A	MOPS for an Airborne VDLM2 System
RTCA	DO-280A	Interoperability Requirements for ATN Baseline 1
Eurocae	ED-110A	
RTCA	DO-290	System Performance Requirements (SPR) for Air Traffic Data Link Services in Continental Airspace
Eurocae	ED-120	
AEEC	ARINC 631	VHF Digital Link (VDL) Mode 2 Implementation Provisions

110 MEMBERS FROM 25 COUNTRIES



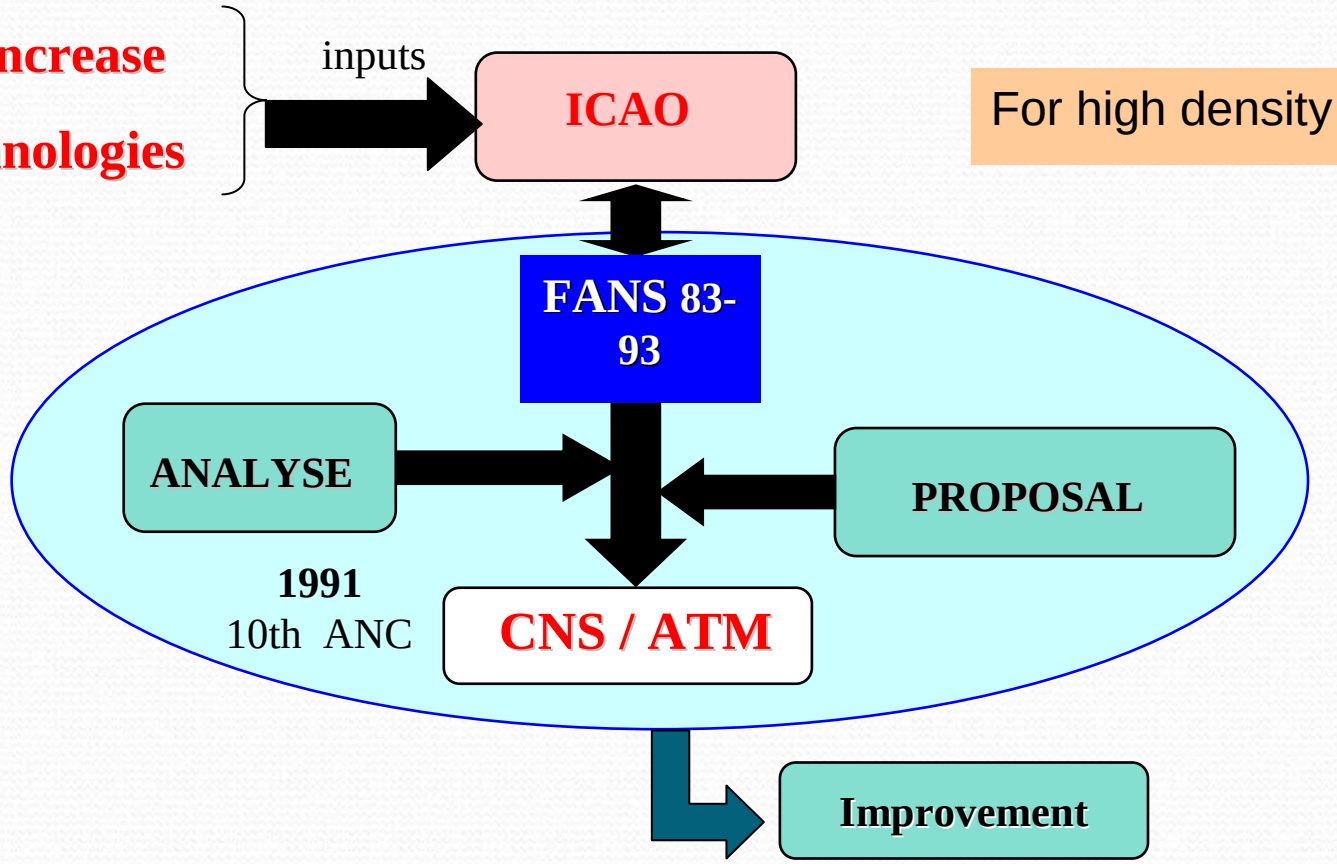
* Non **EUROCAE** Members, but active Partners

Summary


Traffic increased
Security
Certification process
Environment
Airlines

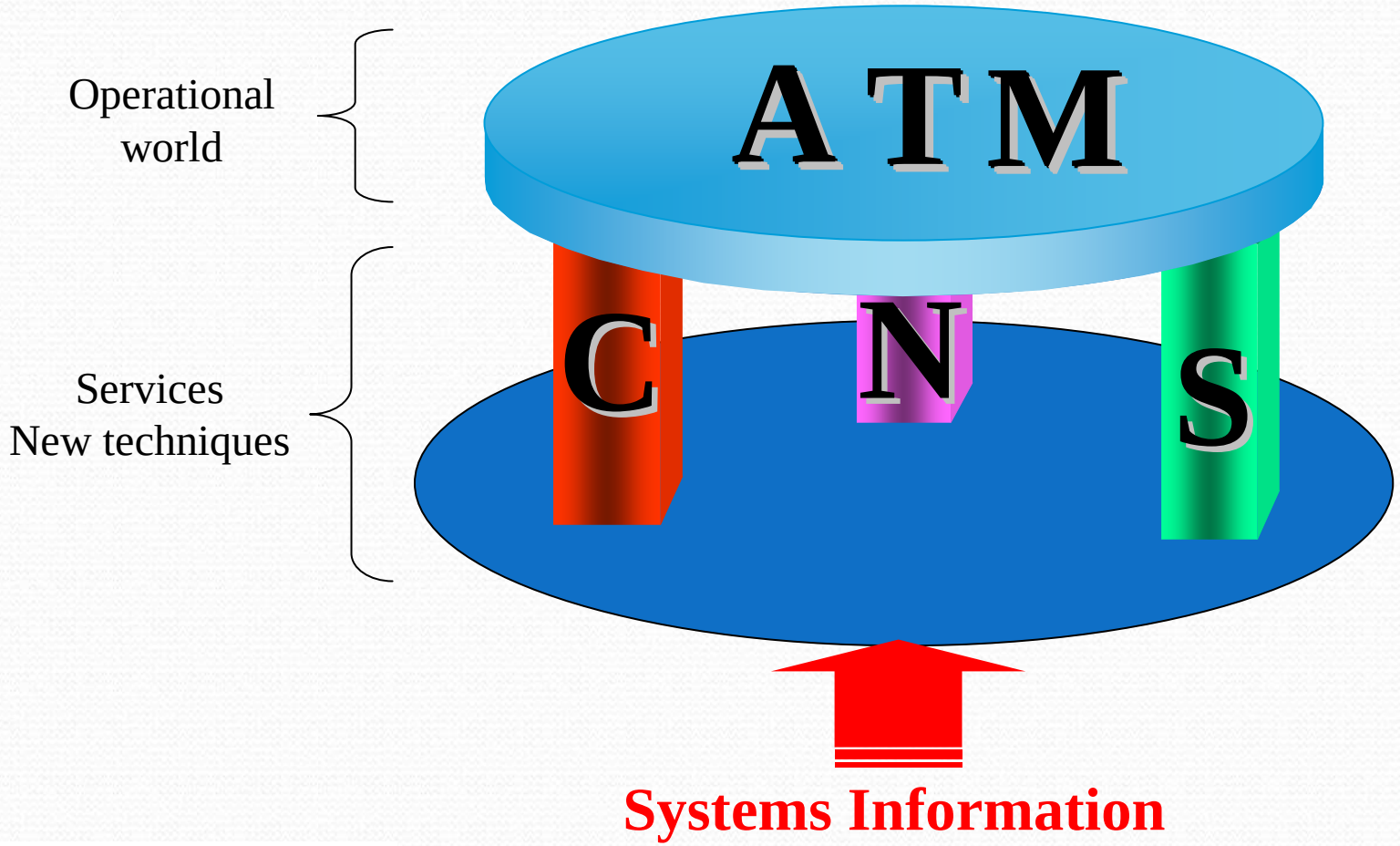
ICAO Answer

- **Traffic increase**
- **New technologies**



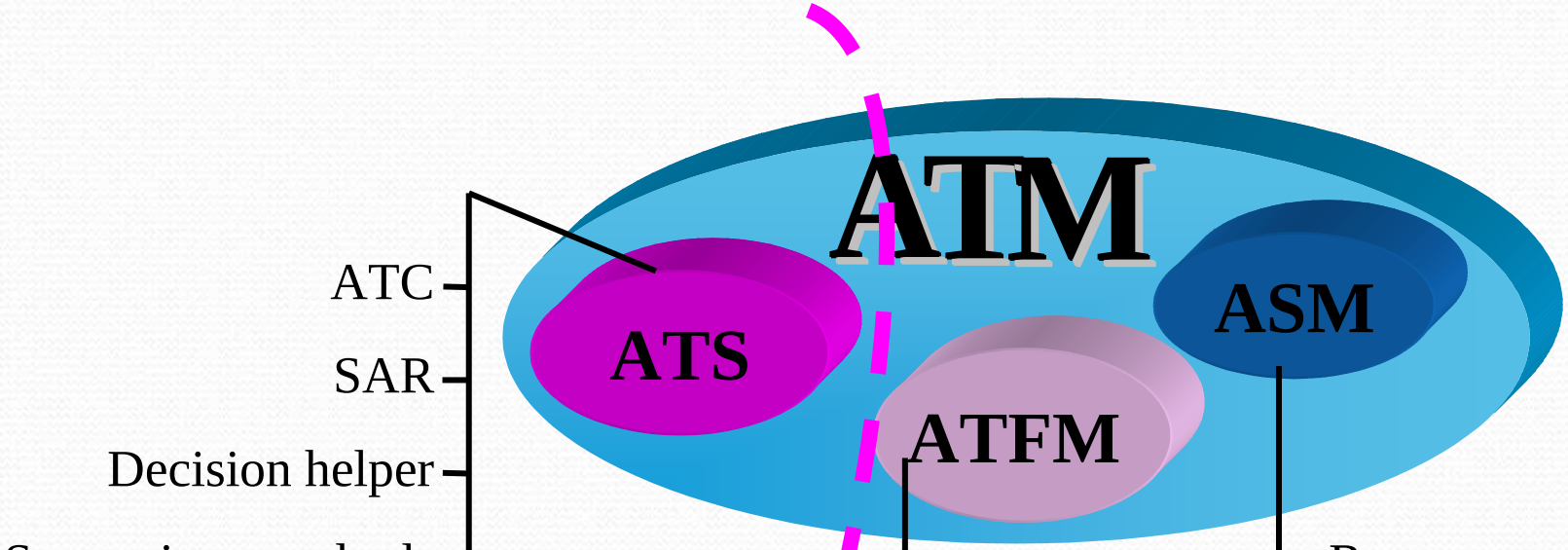
For high density areas

FANS CNS/ATM Concept



ATM

- Set of operational processes and not a set of services
  - Airspace Management
    - structure, division and area
    - rules
  - Air Traffic Flow Management
    - Dynamic balance between demand and capacity
  - Air Traffic Control
    - Airplanes separation
    - scheduling



ATC
SAR
Decision helper
Separation standards

planning
coordination

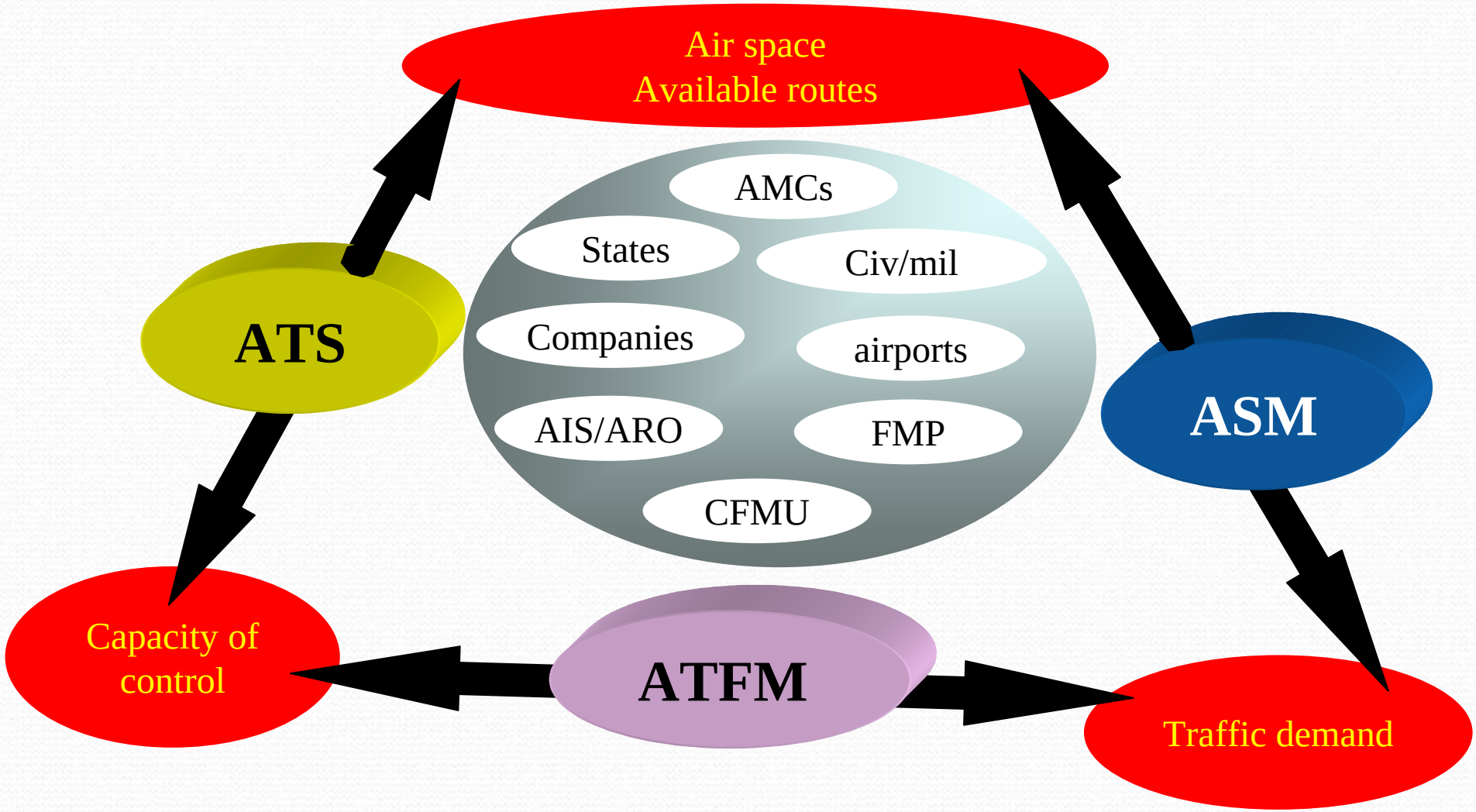
Routes structure
Organization of the aeronautical space

Most important

Safety critical

More and more important

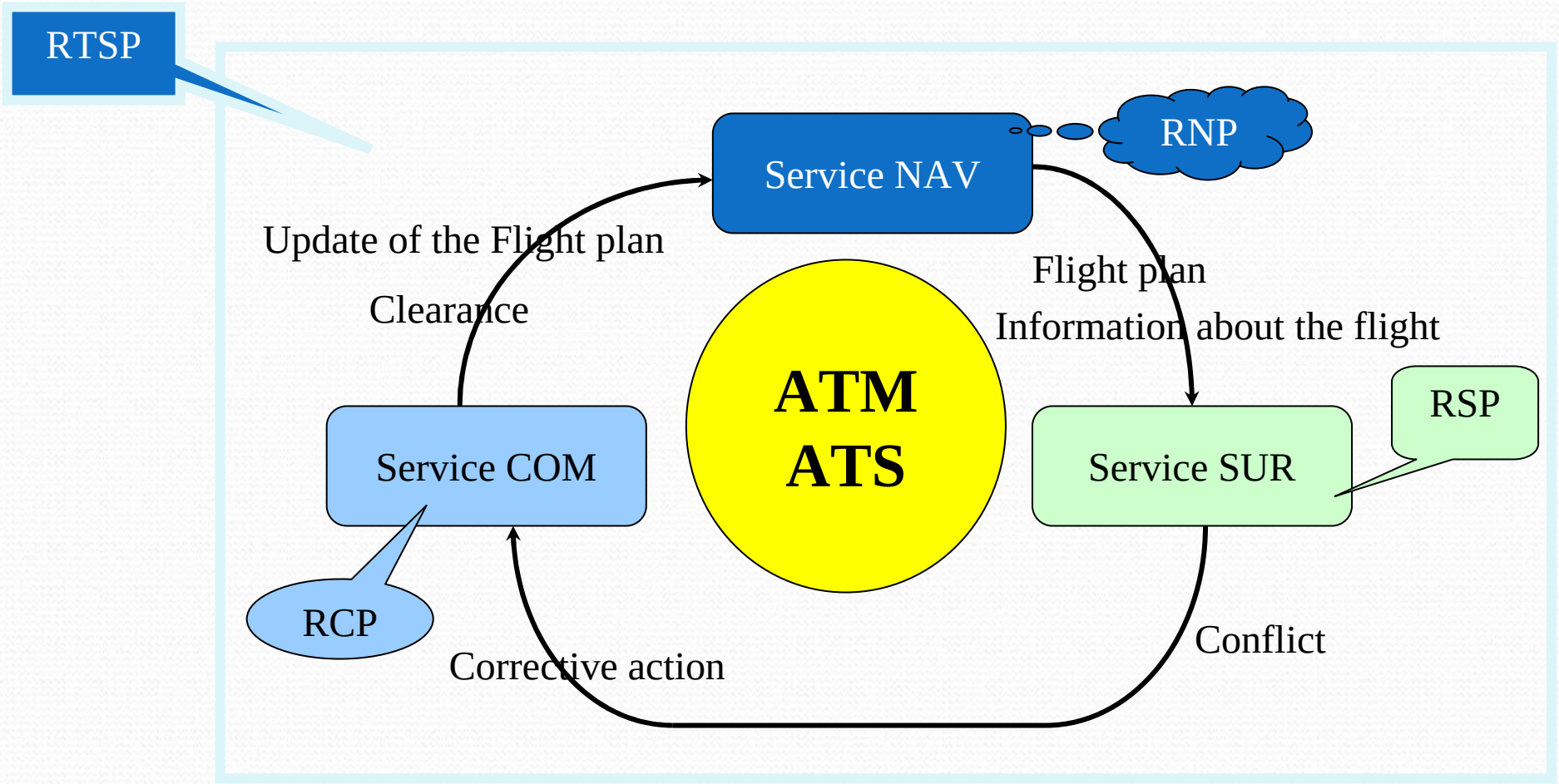
Airspace capacity


Air space
Available routes
AMCs
States
Civ/mil
Companies
airports
AIS/ARO
FMP
CFMU
ATS
ASM
Capacity of control
ATFM
Traffic demand

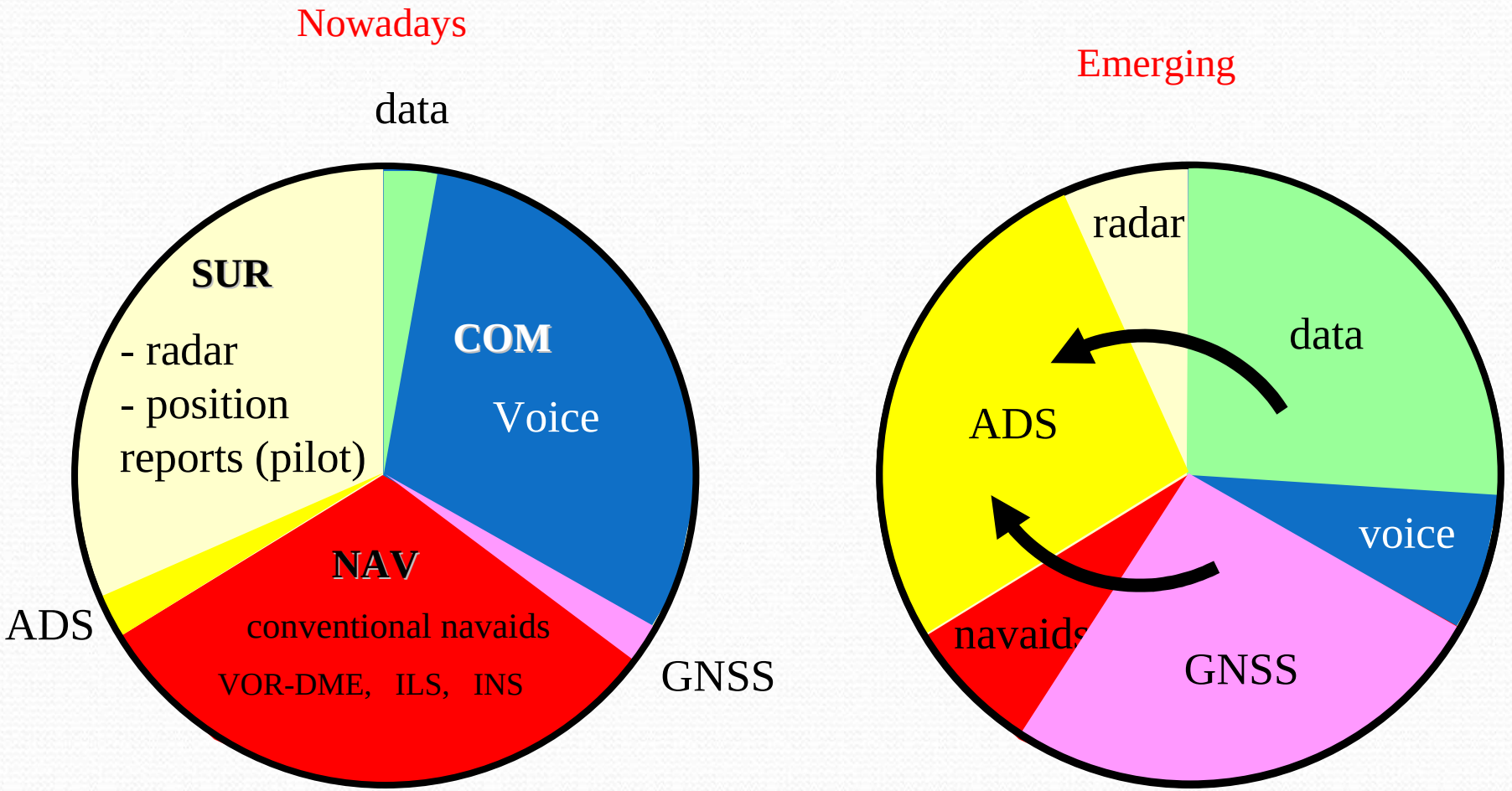
ATM processes vs. services

- Each process
  - Relies on the 3 services : COM/NAV/SUR
  - Need specific performances for a service
  - Has no link with the technology
- Development of RCP/RNP/RSP and RTSP

RxP et ATM


RTSP
Service NAV
RNP
Update of the Flight plan
Clearance
Flight plan
Information about the flight
ATM
ATS
Service COM
Service SUR
RSP
RCP
Corrective action
Conflict

Services ATM et Systèmes



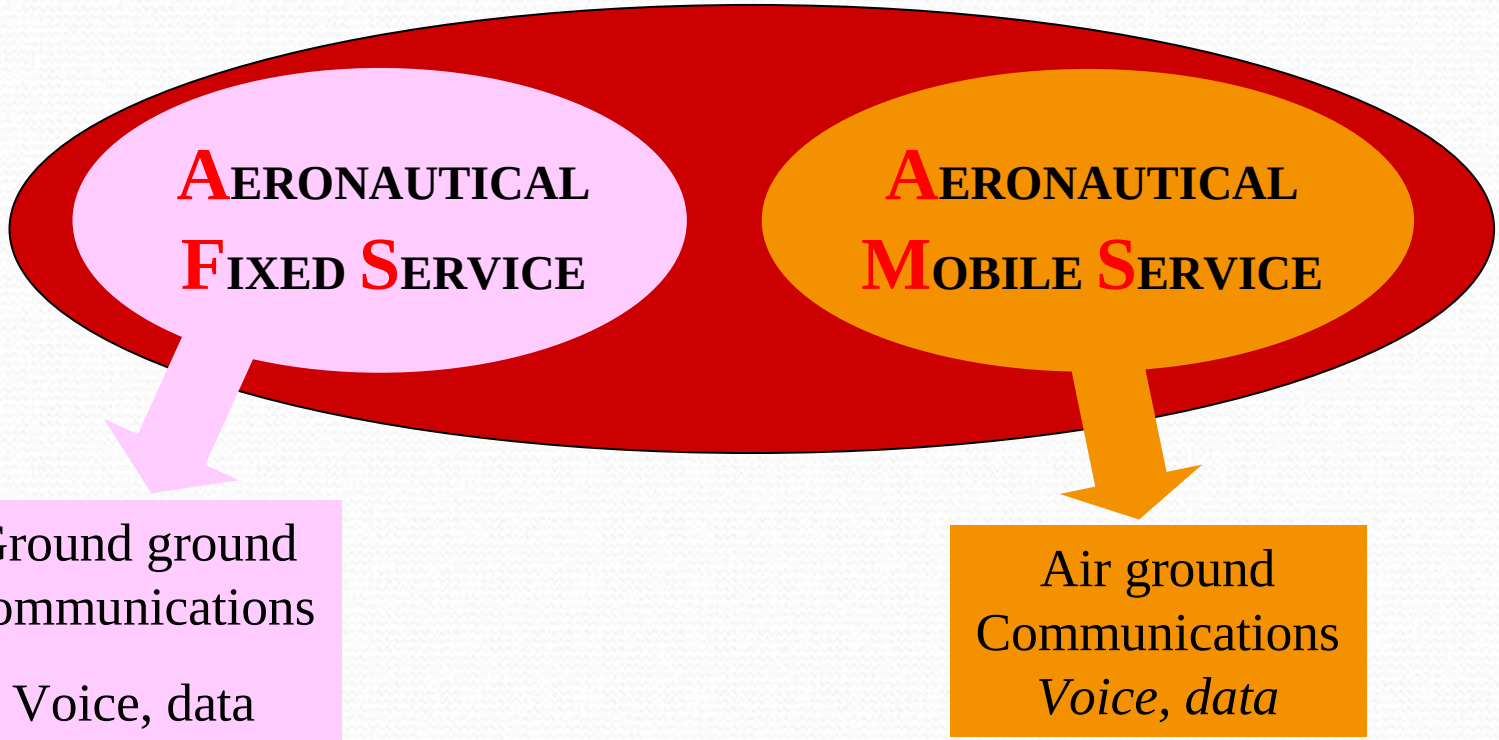
Types of Communication Services

- Safety Communications
  - Air Traffic Services (ATS)
    - Air Traffic Control
    - Weather and Flight Information Services
  - Aeronautical Operational Control (AOC)
    - Dispatch, Flight Planning, and independent company communications

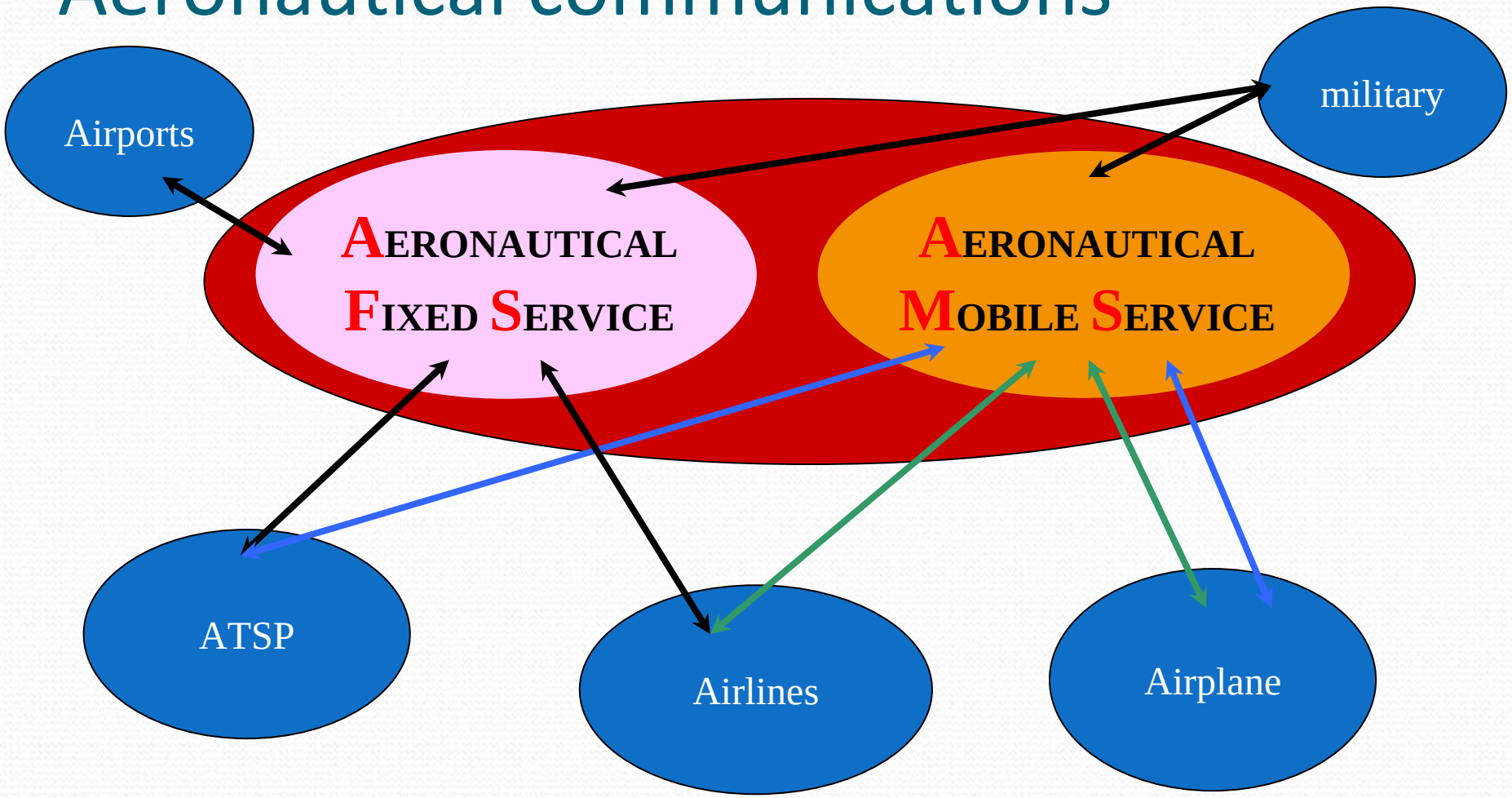
Types of Communication Services

- Non Safety Communications
  - Aeronautical Administrative Communications (AAC)
    - Cabin Provisioning, other company related non-safety communications
  - Aeronautical Passenger Communications (APC)
    - Public Correspondence, personal communications by/for passengers.

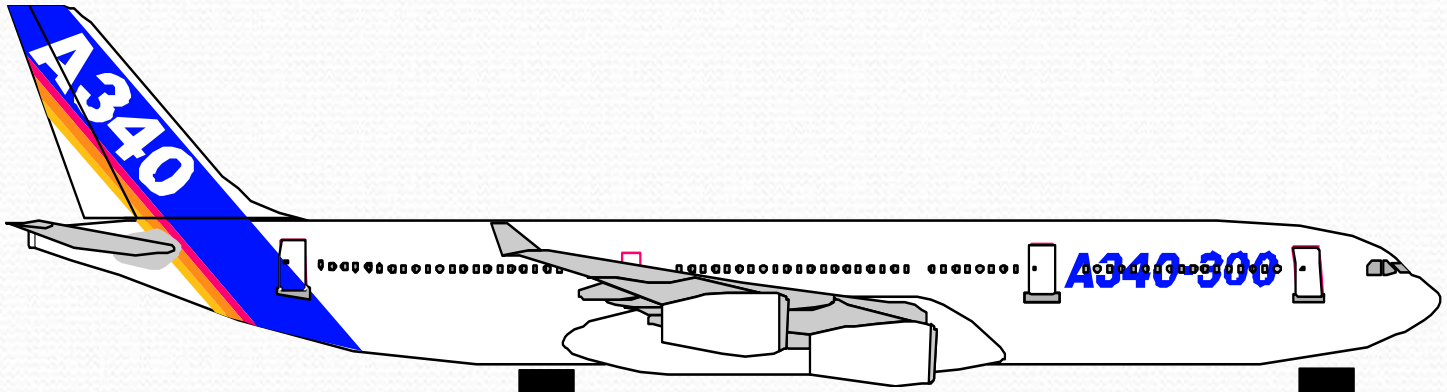
Aeronautical communications



Aeronautical communications



Today mobile services



Cabin Services

Cockpit Services

APC

AAC

AOC

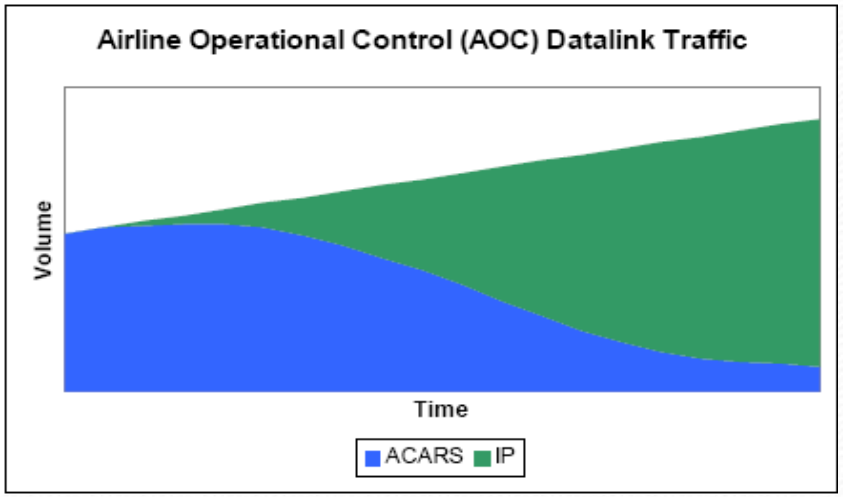
ATC

GROUND

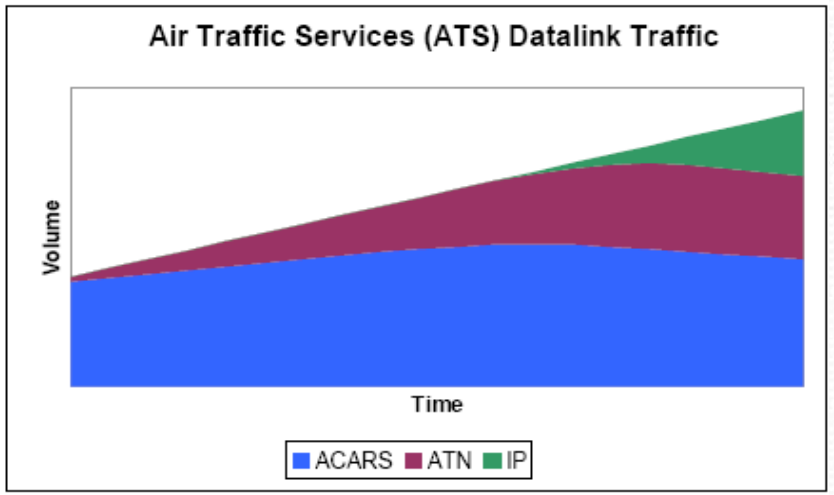
Trends

- Boeing Study

>90 % Traffic



<10 % Traffic



Trends

- SITA already offers IP communication services for the planes
  - INMARSAT Swift 64
- ICAO is studying IP for ATC purposes

Conclusion

- At the beginning
  - No link between COM/NAV and SURV
  - One application = one system
- Need to change: the FANS concept
- Moving towards
  - Operational processes superseding techniques
  - Use of RxP instead of techniques definition

BUT

- Interconnection aspect
  - No technical chain selection = too many chains
  - Selection of techniques cannot be avoided
- Financial aspect
  - System shall be public
  - Carrying sub-network shall be shared
- Security constraint is arising

So…

- Balanced solutions shall be found…