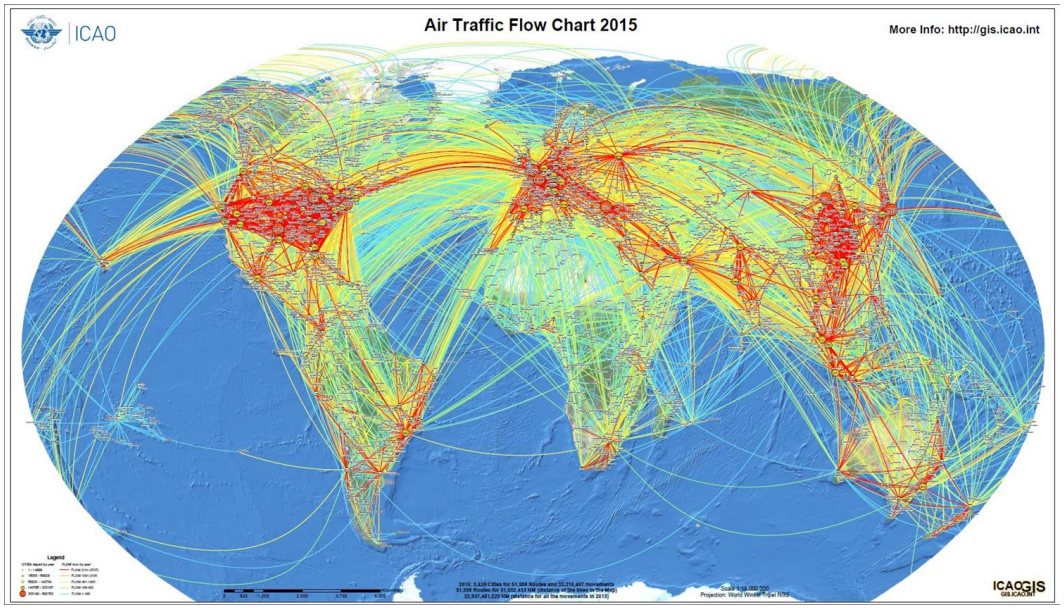
Os desafios da Regulação do Espetro – uma perspetiva da Aviação Civil

11º Congresso URSI
2017 Lisboa
Novas Tecnologias para a Mobilidade

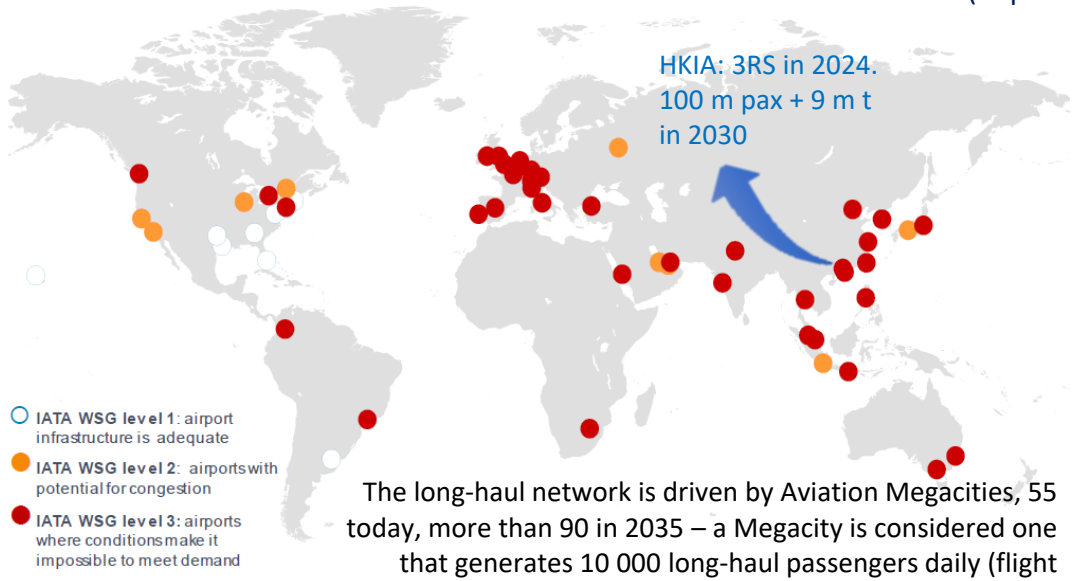
Mário Araújo

Aviation Megacities (Top) and Air Traffic Flow Chart in 2015



Rank 2015	Airport	Nr. of Passengers (m)
1	Hartsfield-Jackson Atlanta	101
2	Beijing Capital	90
3	Dubai	78
4	O'Hare	77
5	Tokyo Haneda	75
6	London Heathrow	75
7	Los Angeles	75
8	Hong Kong	68
9	Paris-Charles de Gaulle	66
10	Dallas/Forth Worth	64
11	Istanbul Ataturk	62
12	Frankfurt	61

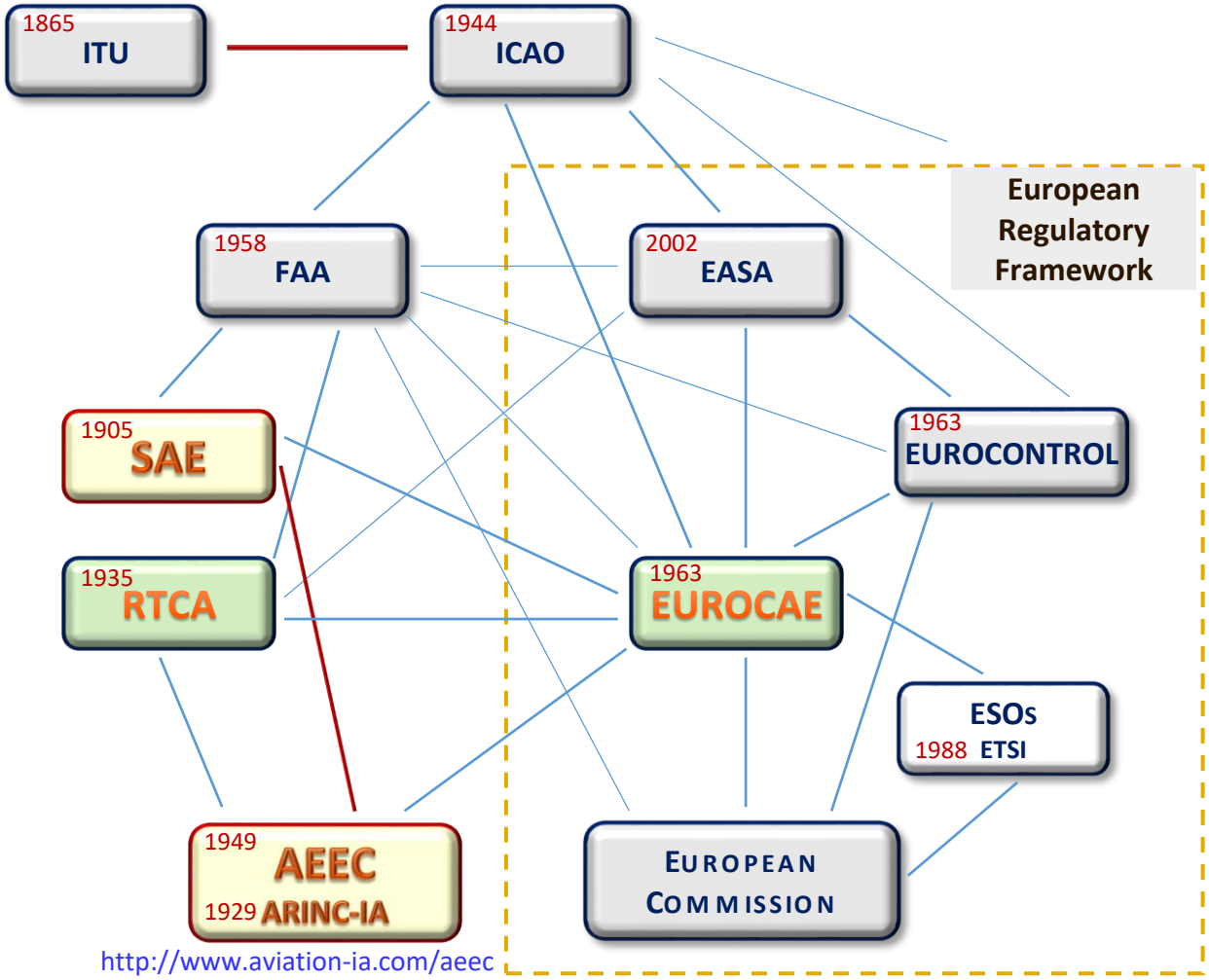
ACI ranking of airports measured by passenger traffic (enplaned, deplaned and direct-transit) in 2015.



The long-haul network is driven by Aviation Megacities, 55 today, more than 90 in 2035 – a Megacity is considered one that generates 10 000 long-haul passengers daily (flight distances over 2000 nm) excluding domestic traffic.

Source: Airbus, IATA, ACI, ICAO.

Regulatory Framework dealing with Aviation and RF Management



Level of Standards

ICAO
SARPs Standards
and Recommended Practices

EASA
(E)TSOs European Technical Standard Orders

EUROCONTROL
ESARRs
Eurocontrol Safety Regulatory Requirements

EUROCAE
MOPS Guidelines
Minimum Operational Performance Specification
MASPS Guidelines
Minimum Aviation System Performance Standards

EUROPEAN STANDARDS
ER's, IR's and CS's
Essential Requirements
Implementation Rules &
Community Specifications

How many Antennae in a jetliner?

Exemple : Boeing 787 Antennae

- **LAN/TWLU** Terminal wireless local area network (LAN) unit
- **ATC/TCAS** Air traffic control/traffic collision and avoidance system
- **DME** Distance measuring equipment
- **RA** Radio altimeter
- **GPS** Global positioning system
- **TCS** Terminal cellular system
- **ADF** Automatic direction finder
- **CWLU** Crew wireless LAN unit
- **ELT** Emergency locator transmitter
- **HF** High-frequency radio
- **VOR** VHF omni-directional ranging

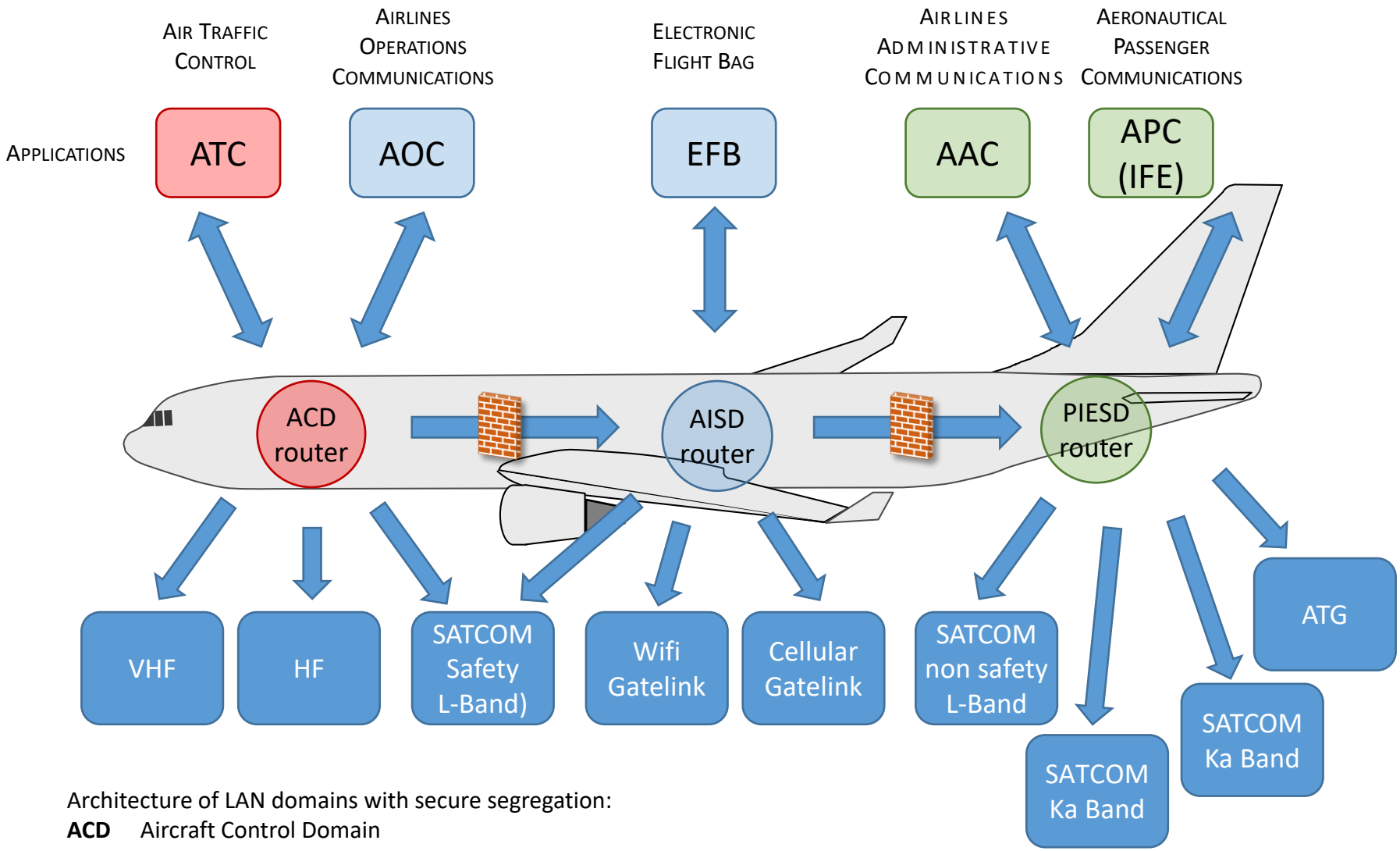
Source: Boeing

Other Examples

WRC-15 approved worldwide primary allocation to the AMS(R)S in the **4200-4400 MHz** band to support **WAIC** (Wireless Avionics Intracommunications):

- Intra fuselage/cabin radiocommunication between 2 or more stations on a single aircraft for safety-related apps only, part of a closed network required for operation of aircraft, 10 mW or 50 mW
- Cannot cause harmful interference to RALT (Radio Altimeter)
- Next steps: development of ICAO SARPS, RTCA SC-236/Eurocae WG-96 MOPS and MASPS

Aeronautical Applications Requiring Communications



Architecture of LAN domains with secure segregation:

ACD Aircraft Control Domain

AISD Aircraft Information Service Domain

PIESD Passenger Information and Entertainment Services Domain

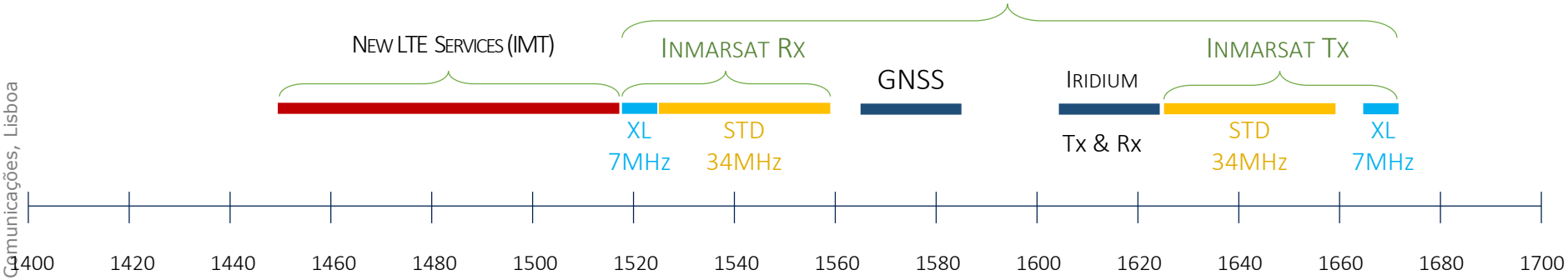
Need of Binding obligation on MS to ensure adequate protection

ECC Report 263 studies adjacent band compatibility and identifies needs of **restrictions/limitations in IMT BSs** new LTE band around airports to avoid harmful interference to aircraft satellite equipment. It is important the upcoming draft EC decision includes a binding obligation on Member States to ensure **adequate protection** for existing aviation and maritime users.

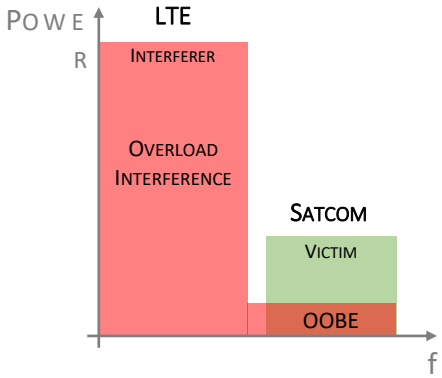
Present satellite receivers cannot handle a blocking level of – 30 dBm (resilience to LTE is only up to – 60 dBm)

Inmarsat Rx: [1518 – 1525] MHz + [1525 – 1559] MHz
Inmarsat Tx: [1626.5 – 1660.5] MHz + [1668 – 1675] MHz

Established MSS & GNSS Aeronautical & Maritime Safety Services



AMS(R)S Services throughout L-Band – communications are appropriately protected from interference due to Primary Allocation Status
STD (Standard) and XL (Extended Bands)
Frequency/MHz



IMT International Mobile Telecommunications
MSS Mobile Satellite Services
AMSS Aeronautical Mobile Satellite Services – Non-safety
AMS(R)S Aeronautical Mobile Satellite (Route) Services – Safety

Navigation & Surveillance Enablers to Reduced Separation in Oceanic & Remote Areas