

Frequencies for commercial and business aircraft



Groupement des Industries Françaises
Aéronautiques et Spatiales



Sector Situation

Stakes

Commercial and Business aircraft are equipped with **Communications, Navigation and Surveillance** systems (CNS) which provide essential and critical safety functions related to airworthiness and flight regularity.

The aviation sector is characterised by specific aerospace and safety factors, which distinguish it from other users of the spectrum. Indeed, the functions and performances associated with it require continuous availability of the spectrum (**exclusive spectrum**).

CNS systems are standardised by ICAO (International Civil Aviation Organization) thus, beyond the harmonised regulatory framework, it ensures the worldwide interoperability of all the on-board Radio systems:

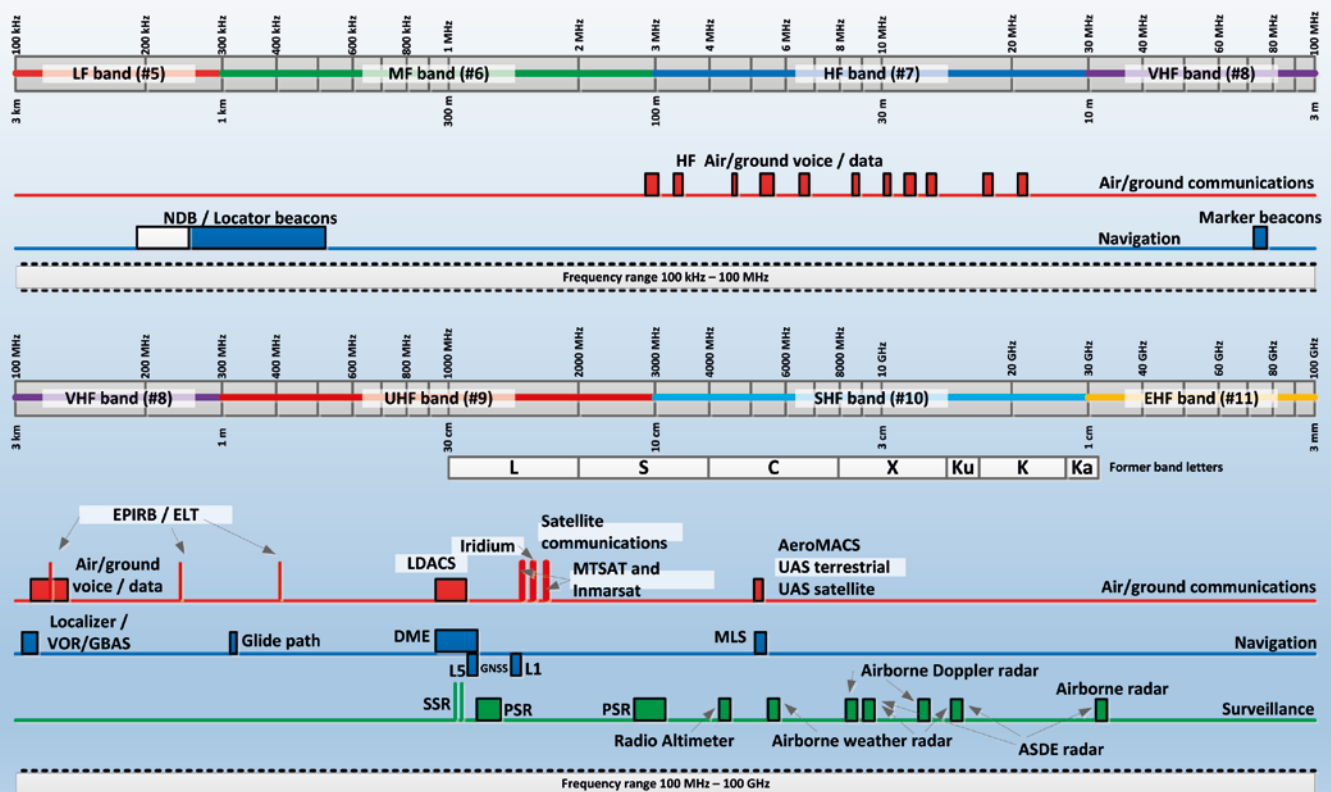
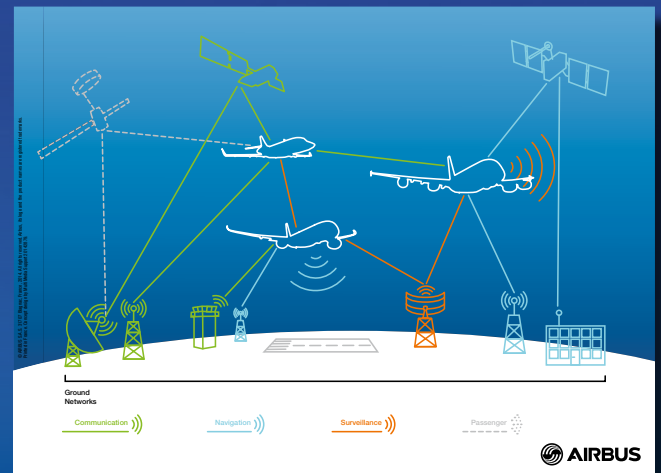
- Radio Communication, voice and data links (VHF, HF, Inmarsat or Iridium Satcom...);
- Air Traffic Control & Air Traffic Monitoring (ATC, ACAS / TCAS, ADS-B);
- ELT-DT (Distress Tracking);
- Weather(Radar for cloud detection, thunderstorms, ice, windshear...);
- Navigation:
 - Global Navigation Satellite Systems (GNSS);
 - Radio aids; (ILS, DME and MKR for landing, VOR and DME for positioning, ADF for bearing);
- Radar imagery aids (EFVS for low visibility approach and landing);
- Radio Altimeters;
- Telemetry;
- WAIC «Wireless Avionics Intra-Communications» defined for the use of safety-related wireless systems within an aircraft.



In addition, means used by airlines for Operations and Maintenance purposes require significant bandwidth.

Cabin needs have also been expressed to offer passengers **"Connectivity"** related services:

- Communication Air - Ground (messaging, phone, internet...), Passenger Entertainment (Live TV, gaming);
- External and internal Communications (Wi-Fi networks, 4G, 5G networks, WLAN...);
- Direct Air to Ground (DA2G);
- Broadband SATCOM (Ku, Ka bands...).



Notes:
 Drawing not to scale
 Not all Regional or sub-regional allocations are shown
 Band identification (e.g. VHF) and band # per Radio Regulations
 The satellite communication bands used by MTSAT and Inmarsat are not allocated to the Aeronautical Mobile Satellite (R) Service



Social and economic importance

Quoted from ATAG Aviation: Benefits Beyond Borders global report– dated September 2020. These figures reflect the pre-Covid-19 situation: a 'normal' year for air transport; Covid led to a drop and a pause, but traffic is recovering and is almost at the same level just before the crisis.

- More than **4.5 billion passengers** and **61 million tonnes of cargo** per year;
- Air traffic has doubled every 15 years since 1971 except during the Covid-19 crisis;
- Overall economic impact (for the airline industry):
 - 3 500 billion dollars of revenue (direct, indirect, induced & Tourism catalyst);
 - 4.1% of global GDP (would rank 17th in the world if the airline industry was a country);
 - 11,3 million direct jobs;
 - 87.7 million jobs globally.
- 1 480 Airlines;
- 34 000 commercial aircraft in service;
- 3 780 commercial airports.

Specificities

Frequencies allocated to commercial and business aviation for CNS require special protection against unwanted interference phenomena from other services. Exclusive or primary allocations must be made to ensure the safety and regularity of flights.

Beyond compliance with international regulations, some countries/authorities impose the carriage of specific systems over their territory or according to the routes followed or flown by the plane (polar, over water, desert areas...).

In addition, to meet the safety objectives and to allow operational availability of aircraft, systems installed on aircraft are redundant which potentially increase the spectral occupancy.

Military and/or government aircraft are subject to specific qualifications and regulations and can operate other specific means which use frequencies allocated to Ministries of Defence and Interior without forgetting the standardisation between NATO states.

The spectrum allocated to the aeronautical sector is spread over the entire envelope of the frequency spectrum (from



100 kHz to 30 GHz) and is spread over the three basic functions: Communication, Navigation and Surveillance.

In addition to wavelength features, the spectrum is very diverse because it is used for air-ground, ground-ground, air-to-air communications and Satellites. The technologies are both analogue and digital as well as vocal and/or data applications. CNS lifespan is very long to enable a return on investment for ground infrastructure (stations, networks, and airports), satellite (Constellation stations and networks), and aircraft systems, as well as to ensure very long-term sustainability and worldwide interoperability.

The frequencies allocated to business and transport aircraft require continuous availability and protection against interference in order to ensure the safety of aircraft, passengers, crews and overflown populations.

Evolution: an industry viewpoint

Aviation is a global industry that must take into account the interests of all users of the airspace. The increase in population and the democratisation of air transport induce a continuous increase in traffic. New flying platforms such as UAVs and other new airspace users are impacting demand for airspace access and rising demand for resources.

Sustainability and decarbonization are the new key drivers for the aeronautical industry and the CNS/ATM is able to contribute by bringing some enhancements through Flight Optimization. Traffic is coming back, and there is a need to accommodate both the post-pandemic air traffic and the foreseen traffic growth according to the recent optimistic previsions estimated at +3.7% per year. In order to absorb this growth with a safety level equivalent to that of today and to welcome new users and services like UAV/UAS, it is imperative to avoid the impending congestion of the frequency spectrum by improving efficiency and increasing the exclusive spectrum for aeronautical systems as necessary.

To support the air traffic management for new UAV/UAS users (UTM), support new low visibility approach procedures and absorb the overall traffic growth, new frequency allocations may be needed.

Aircraft travel over greater distances, communications beyond the horizon as well as flow rates needs, are increasing. Satellite constellations and networks are increasingly used over polar, ocean and desert areas where it is not possible to install infrastructure/terrestrial networks.

With better communication and more accurate navigation systems, it is possible to optimise routes, creating new itineraries and thus reduce fuel consumption and CO₂ emissions, ensuring all-weather approaches and landing, contributing to noise reduction and optimising flight time by mastering departure and arrival times.

The SESAR initiatives (EASA / Eurocontrol) and NextGen (FAA) related to CNS/ATM (Communications, Navigation, Surveillance / Air Traffic Management) are established in such a way to increase the safety, efficiency and capacity of the airspace while maintaining its integrity and reducing environmental impact.

These initiatives, related to ATM, taken up by the ICAO's global spectrum strategy, will establish a sustainable future plan for urban environment and anticipate emerging needs associated with society evolution.

The frequency spectrum is increasingly requested for new applications, particularly from the mobile and internet industry (4G/5G/6G, Wi-fi, WLAN, RLAN, Machine Type Communications...).

It is therefore vital for aviation to:

- **Avoid congestion of the frequency spectrum currently assigned.**
- **Sustain the existing allocations for systems called "Safety of Life" awarded to Radio Communication, Navigation and Surveillance Systems, and Telemetry with the help of the Civil Aviation Authorities and ICAO and Air Navigation Service Providers.**
- **Preserve the benefits obtained for the new systems defined by SESAR and NextGen and communications regarding unmanned aircraft systems (UAS/RPAS) in non-segregated airspace.**

Further to the last World Radiocommunications Conference 2019 decisions, it is now possible to:

- **Operate High Altitude Platform Stations (HAPS).**
- **Allow Earth Stations In Motion (ESIM) in Ka band which permits development for Aero Connectivity.**

New Agenda Items were raised in the interest/need of the aeronautical industry.

Spectrum requirements

The roadmap established by ICAO aims to improve the efficiency of spectrum allocated to civil aviation, to establish a transition plan with new technologies and functions defined in the CNS/ATM Plan and define the new spectrum requirements to cover the traffic growth over the long term including new flying platforms (Drones, Space planes..).

The following points of World Radiocommunications Conference 2019 agenda, impacting aviation and to be finalised in WRC 2023, are representative of the Aerospace industry involvement and challenges:

- **Agenda Item 1.4: To permit high-altitude platform stations as IMT base stations (HIBS) using the Mobile Service.**
- **Agenda Item 1.6: Facilitate communications for "sub-orbital" vehicles.**
- **Agenda Item 1.7: To allow Earth-to-space and space-to-Earth VHF communications via satellite.**
- **Agenda Item 1.8: Whether to allow the Fixed-Satellite Service (FSS) to provide safety related communications (CNPC) for unmanned aircraft systems.**
- **Agenda Item 1.9: to review Appendix 27 of the RR and consider appropriate regulatory actions and updates to accommodate digital technologies for commercial aviation safety-of-life applications in existing AM(R)S HF bands.**
- **Agenda Item 9.1b: Review of the amateur service and the amateur-satellite service allocations to determine if additional measures are required to ensure protection of the radionavigation-satellite (space-to-Earth).**

Other spectrum challenges are also identified such as the use of new technologies (Short Range Device, RFID, WiGig, Internet of Things...) to enhance passenger experience and airlines demands on board aircraft.

About GIFAS

GIFAS is a Trade Association with over 440 members, from major prime contractors and system suppliers to small specialist companies. They cover the full spectrum of skills from the design, development and production of aerospace systems to marketing, maintenance and operation. GIFAS members are active in all sectors of the aerospace industry including civil and military aircraft, helicopters, engines, missiles and weapons, satellites and launch systems, UAV, large aerospace, defence and security systems, equipment, subassemblies and associated software applications. Managed through dedicated entities, GIFAS structures its recommendations in the spectrum domain through the Frequencies Commission.

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